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Russell

Geologorum Conventus.—Mente et Malleo.

THE WORK

OF THE

International Congress

OF

GEOLOGISTS,

AND OF THE

COMMITTEES.

Published by the American Committee.

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PERSIFOR FRAZER,
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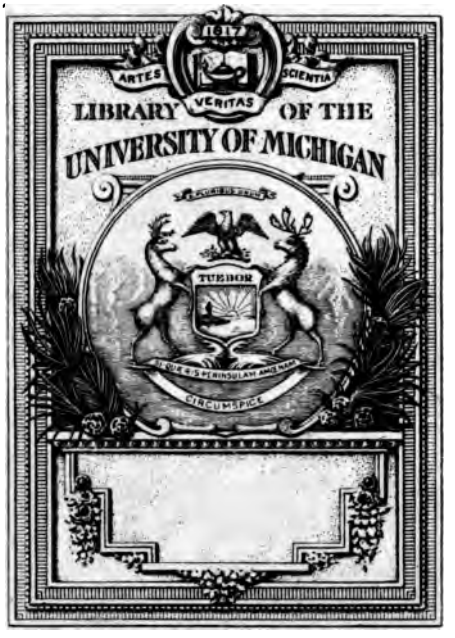
1886.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Geologorum Conventus.—Mente et Malleo.

I. C. Russell

177

THE WORK

OF THE

INTERNATIONAL CONGRESS

OF

GEOLOGISTS,

AND OF ITS

COMMITTEES.

Published by the American Committee.

UNDER THE DIRECTION OF

PERSIFOR FRAZER,
DOCTEUR ES-SCIENCES NATURELLES.
(*Univ. de France.*)
SECRETARY.

1886.

American Committee of the International Congress of Geologists.

PROF. JAMES HALL, *N. Y. State Geologist, President.*

PROF. SIR J. W. DAWSON, *LL.D., F. R. S., Principal McGill College, Montreal.*

PROF. J. S. NEWBERRY, *M. D., LL.D.*

DR. T. STERRY HUNT, *LL.D. (Cantab.) F. R. S., Secretary.*

PROF. C. H. HITCHCOCK, *State Geologist, N. H.*

PROF. RAPHAEL PUMPELLY.

PROF. H. S. WILLIAMS, *Ph. D.*

PROF. J. P. LESLEY, *State Geologist, Penn.*

MAJOR J. W. POWELL, *Ph. D., Director U. S. Geol. Survey.*

PROF. G. H. COOK, *State Geologist, N. J.*

PROF. J. J. STEVENSON.

PROF. E. D. COPE.

PROF. E. A. SMITH, *State Geologist, Alabama.*

PROF. PERSIFOR FRAZER. *D. ès- Sci. Nat. (Univ. de France), Secretary.*

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NOTE.

PROF. N. H. WINCHELL, *State Geologist, Minnesota*,

should have been added to the list on the opposite page, but owing to an accidental omission in the record of the Proceedings of the Standing Committee of the American Association for the Advancement of Science at its Ann Arbor meeting, which was furnished to the Secretary, the name of Prof. Winchell was not printed with those of the other members of the Committee. It is added on all the copies of the pamphlet which are yet unsold.

P. F.

2-X-38

TABLE OF CONTENTS.

	PAGES.
Title,	1
Names of the American Committee,	2
Proceedings of the Meeting of the American Committee at the Windsor Hotel, New York, January 8th, 1886,	3–7
Circular of the American Committee to American Geologists,	7
Preface and address to American Geologists	11–14
Proceedings of the third (Berlin) Session of the International Congress of Geologists; Tuesday, September 29th to Saturday, October 3d,	15–36
Report of the International Committee on the Geological Map of Europe by the Secretary, Prof. Renevier,	37–46
Report of the International Committee on the Uniformity of Nomenclature by the Secretary, Prof. Dewalque,	47–65
Classification of the Eruptive Rocks for the International Geological Map of Europe,	65–71
Report of the German Committee,	73
Abstract of the Report of the English Committee,	73–91
" " " " Belgian "	91–92
" " " " Spanish "	92–93
" " " " French "	93–96
" " " " Hungarian "	96–97
" " " " Portuguese "	98–100
" " " " Roumanian "	100–102
Report of the Swiss Committee,	102
Communication of Prof. Renevier to the Societé Vaudoise des Sciences Naturelles, embodying the Mongrams and legend adopted for the International Map of Europe,	103–106
Note on the test area selected by Major Powell, for representation by his own and other proposed systems,	106
Letter of Major Powell on the color scale and symbols of the International Geological Congress,	106–108
Note on the means employed to secure accuracy of the Report of the Proceedings of the Congress,	108–109
Color Scale proposed by the Congress for the Geological Map of Europe,	Plate at end.

MEETING

OF THE

AMERICAN COMMITTEE

OF THE

INTERNATIONAL CONGRESS OF GEOLOGISTS.

(Held in the Windsor Hotel, New York City, Friday, January 8th, 1886.)

THE meeting was called by order of the President of the Committee, Prof. James Hall, to hear the report of the Secretary of the Committee-Delegates at Berlin, and to transact other business.

The meeting was called to order at 11.15 A. M. by the President.

There were present Prof. James Hall (President of the American committee); Dr. T. Sterry Hunt (Secretary of the original committee); Prof. J. S. Newberry; Prof. C. H. Hitchcock; Prof. J. J. Stevenson; Prof. Geo. H. Cook; Mr. McGee (representing Major Powell); and Prof. Frazer (Secretary of the Committee-Delegates at Berlin).

The roll of the Committee (appointed at different times by the A. A. A. S.) was called, and, on motion, Mr. McGee was admitted to the meeting to represent Major Powell, who was absent.

Dr. Hunt, as Secretary of the original Committee, made a statement in regard to the position of the President, Prof. James Hall, and himself in the American Committee.

On motion Dr. Frazer was elected Secretary of the meeting.

The Secretary, read communications from Sir William Dawson, Prof. Newberry, Prof. Stevenson, and Prof. Williams.

Dr. Frazer then read his report of the proceedings of the Berlin Congress, calling attention to the correction of Prof. Dewalque in "Science," and to the error in connection with Prof. Newberry's remarks in the debate on the separation of the Permian and Carboniferous which appeared in the *American Journal of Science* for December last. The Secretary informed the Committee that he had taken the responsibility of ordering 300 extras to be struck off by the printer of the *Journal*, and that they were lying in sheets awaiting the pleasure of the American Committee. He further stated that he had requested Geheim-Bergrath Hauchecorne to permit 300 copies of the color-scale adopted at Berlin to be printed and sent out to America to accompany the report just read, and had received the following reply.

Direction de la carte géologique de l'Europe. BERLIN, le 17. Dec., 1886. (Translation)

Journ. No. 299.

I have the honor to inform you, in connection with your favor of the 30th ultimo, that I have requested the Berlin Lithographic Institute here to prepare and send you, together with the bill for the same, *direct*, 300 copies of the color-scale for the geological general map of Europe. By a communication received from this Institute to-day I learn that it has already taken in hand the preparation of the said scale, so that I may hope that you will be soon in possession of the same.

With high respect,
HAUCHECORNE,
Privy Counsellor of Mines.

Mr. McGee moved and Prof. Cook seconded, that the American Committee endorse the action of Dr. Frazer in ordering 300 copies of the report and color-scale. Carried.

Dr. Newberry moved that the translation of the reports of the "Committee on Nomenclature" and "On the European map" be added to the report of the Secretary, together with either the full report of the English committee, or such digest of it as should seem expedient. Carried.

Dr. Newberry moved that the printing be done under the direction of Dr. Frazer. Carried.

It was moved and seconded that a circular be sent out to those on a list to be prepared by Prof. Hall, Dr. Hunt and Dr. Frazer, informing them that each person might take one or two copies of the report with color scale at 50c. each. Carried.

Dr. Newberry moved that the Committee authorize the preparation of an address as a preface to the report to be sent out, recommending to the U. S. and to the State Geological Surveys the acceptation of the color scale adopted at Berlin, in so far as this does not necessitate the adoption of the classification and nomenclature of the map of Europe. Carried.

It was moved and seconded that a sub-committee of five be appointed to discuss the attitude of the American Committee and of American geologists toward the final decisions on nomenclature, which may be arrived at by the London Congress; and that this sub-committee report at a subsequent meeting of this Committee. Carried. The President appointed Prof. Newberry, Dr. Hunt, Prof. Hitchcock, Major Powell and Dr. Frazer.

It was decided to postpone the question of the proper representation of American geologists in London till a future meeting.

It was decided to appoint a sub-committee to consider the best means of securing the co-operation of the scientific societies of the country, and especially of the A. A. A. S. with American geologists to induce the International Congress to hold its next (after the London) session in the United States. The President appointed on this Committee Dr. Frazer, Prof. Hitchcock and Prof. Cook.

Dr. Frazer moved that a sub-committee of the original members should be appointed to put themselves in communication with the Committee of Direction of the European Map, in order to ascertain whether it be not possible to add the United States to the list of "Grands Etats" of which each has the privilege of subscribing for 100 copies of the map of Europe at 100 francs a copy. Dr. Hunt amended by adding Dr. Frazer to the Committee. Carried. The President appointed Prof. Hall, Dr. Hunt, Sir Wm. Dawson, Prof. Lesley, Major Powell and Dr. Frazer.

The Secretary was directed to assess each member his share of the expenses of this meeting.

It was moved and seconded that the Secretary prepare a digest of the proceedings of this meeting, and add it to the report which is to be sent out by this Committee. Carried.

It was moved and seconded that the time and place of the next meeting be left to the option of the President. Carried.

Prof. Stevenson moved that Prof. Hitchcock be requested to color, according to the system adopted at Berlin for the European map, the area selected by Major Powell to test the efficiency of different color systems. Carried.*

On motion the meeting adjourned.

In accordance with the above instructions the following circular was prepared, and submitted to every member of the American Committee. Unexpected delays in procuring the list from the Committee induced the Secretary to send the circular to all persons mentioned as geologists or palæontologists of the United States or Canada in Casino's Naturalists' Directory for 1882–3.

After sending out the circular to those on Casino's list, the Secretary received through the kindness of Prof. F. W. Putnam and Major Powell respectively, lists of Section E. of the American Association for the Advancement of Science, and an exchange list of the U. S. Geological Survey. A circular was sent to every person on either of these lists.

* See Note 1 at end of pamphlet.

American Committee of the International Congress of Geologists.

March 22d, 1886.

DEAR SIR:—

At a meeting of this Committee, held in New York on January 8th, 1886, it was resolved to distribute among American geologists information of what was done and what was proposed at the late Berlin Congress. To this end the Committee decided to add to the report the Proceedings of that Congress which were printed in the December number of the *American Journal of Science*, translations of the reports of the Congress's committees on "Uniformity of nomenclature" and "On the map of Europe." Besides these, abstracts of the Reports of the National Committees and (through the courtesy of Geheim Bergrath Hauchecorne) a copy of the color-scale adopted by the Congress, will be appended, together with a report of the Committee's meeting in New York, Jan. 8th, 1886.

Will you kindly inform Dr. Persifor Frazer, 201 South Fifth Street, Philadelphia, if you desire one or two copies of the pamphlet at the cost of publication—fifty cents a copy. On account of the small edition, it will not be possible to send more than two copies to any one person until the demand for them is ascertained.

JAMES HALL,	J. P. LESLEY,
J. W. DAWSON,	J. W. POWELL,
J S. NEWBERRY,	G. H. COOK,
T. STERRY HUNT,	J. J. STEVENSON,
C. H. HITCHCOCK,	E. D. COPE,
RAPHAEL PUMPELLY,	E. A. SMITH,
H. S. WILLIAMS,	PERSIFOR FRAZER.

International Geological Congress.

Proceedings of the 3d Session

held at

BERLIN,

(*From Monday, September 28th to Saturday, October 3d*, 1885.)

Reported by

DR. PERSIFOR FRAZER.

Secretary of the American Committee-Delegates.

PREFACE.

By the report of the Proceedings of the American Committee of the International Congress of Geologists, it will appear that the latter has sought to inform American Geologists as to the important matters relating to their science which are being now settled, for good or for evil, by united European action. The committee feeling itself to be simply the servant of its fellow American Geologists, does not feel authorized to offer its advice as to the action which should be taken in the various pending questions, though some of them relate to phenomena which are only to be seen on our continent in their fullest development. Nevertheless, there are some points to which the Committee feels that it should call the attention of those who created it.

The first point is the desirability of harmony in the results reached by this International Convention of Geologists. It would be far better that the matters respecting which conclusions were reached by this Congress should be of the broadest character, than that any views should be put forth with its authority that were insuperably repugnant to even a small number of honest and capable workers. M. Paul Choffat of the Portuguese Committee has been a strong champion of the rights of the minority, both in the report of that Committee, which is appended to Prof. Dewalque's Report; on the floor of the Congress; and in a communication "da Secção dos Trabalhos Geologicos," and published in a late number of the "Jornal de Sciencias Mathematicas Physicas e Naturaes" of Lisbon. Prof. Neumayer, too, urged that the largest liberty of opinion be left to Geologists, and that geological disputes be fought out in the scientific Journals, and settled by instructed scientific opinion, and not by a vote of any one or more sessions of a Congress. The leaders of the late Congress very generally announced the same view, and continually plead for the vote of the Congress on the ground that it did not commit the voter or the Congress to any views, but only permitted the work on the European Geological

map—a purely experimental work—to proceed. It was emphasized that a final decision could be sooner reached on some formulated proposition, even if unacceptable, than without one. Nevertheless, the feeling is shared by many Geologists that the work of undoing anything which receives the sanction of the Congress, will be slow, and that it is possible to seriously hamper the nomenclature of the Science by a call of the ayes and noes of a fortuitous assembly. M. Choffat presents objections to this mode of settling scientific questions which would hold good of any Congress; such as the insufficiency of time for the discussion of each important point,* and the inadequacy of the representation of those who have given special attention to the several questions under discussion. But others of his objections are founded on a condition of things peculiar to the constitution of this Congress.

M. Choffat gives the following table of the delegates at the three sessions of the Congress:

Paris;† 194 Frenchmen and 110 foreigners, representing twenty countries.

Bologna; 149 Italians and 75 foreigners, representing sixteen countries.

Berlin; 163 Germans and 92 foreigners, representing seventeen countries.

In adopting French as the language in which to conduct the proceedings, the Congress probably acted wisely, but no regulation can alter the unfortunate fact that those most capable of throwing light on any important question are generally prevented from debating it by their inability to manage any common language with anything like equal facility.

The best that could be done was done at the Berlin Congress: *i.e.*, a printed statement of the views of most of the National Committees, and of the committees of the Congress was given to each member.

In spite of all these drawbacks to the perfect working of Congress, a great deal can be, and indeed has been accomplished. Let any one reflect on the useless retardation of Science in the last and a large part of this century by conflicts over trivialities of nomenclature, classification and units, and he will

* He estimates the actual working time of the last Congress at *six hours*.

† The number in this case refers to the members inscribed.

be anxious to avoid a way beset by these artificial obstacles. It were better for the growth of our Science that Geologists were united on unsatisfactory systems of nomenclature and coloration than that they should be divided among various good systems; because in the first case the improvements when decided upon, would be accepted by all at the same time, and instead of a confusion of tongues at the outset there would be a gradual evolution of a language which meantime was intelligible to all.

The committee, therefore, urges on all American Geologists, and especially upon the Directors of the State and United States Geological Surveys, of which the publications are so justly prized in Europe, as close a conformity with the recommendations of the International Congress as they may feel able to accord; convinced as it is, that the influence of our own country in settling the most difficult problems, and in moulding the future of Geology, will be great in proportion as it is seen that we earnestly seek accord with other countries.*

A word as to the translation and arrangement of the following pages will not be out of place. When the Secretary had fulfilled the mandate of the American Committee by preparing translations of the Reports of Profs. Dewalque and Renevier, it appeared plain to him that these data would be insufficient without at least some extracts from the Reports of the National Committees. Although Prof. Dewalque manifested the greatest ability and impartiality in dealing with the reports (all but one of which he adds in an Appendix) yet he evidently intended that the original National Reports should be consulted by the reader for detailed matters, which, for obvious reasons, he could not embody in his own. The portions of these National Reports which the Secretary thought most important were therefore added as an Appendix to the translation of Prof. Dewalque's Report.

The Report of the English National Committee does not appear among those of the other National Committees in Prof. Dewalque's Appendix, but whether because it was so long (147 pages) and so uncondensable; or because it was written in English, is not known. Prof. T. McKenny Hughes kindly forwarded a few copies of the English Report, and it was found to contain

* See Note 2 at end of pamphlet.

so much valuable information not easily obtainable elsewhere, that the somewhat desultory excerpts from it made a longer paper than was intended. The great difficulty was to know what to omit.

In translating the reports, an attempt has been made to preserve as carefully as possible their form as well as their sense.

Although *stage* is given in the Report on Nomenclature as the equivalent of *étage*, and is actually thus used in the English Report, it was thought better in these pages to use the French word, which is more generally understood in the sense in which it is here employed. The addendum to the Report on Nomenclature which contained the classification of the Eruptive Rocks having been lithographed in script, its translation keeps this character.

P. F.

The following report of the third or Berlin session of the International Geological Congress is from notes taken by the Secretary of the American committee-delegates. These notes were afterwards written out in full, with the kind assistance of Professor H. S. Williams to whom the writer hereby expresses his sincere obligations.* It will be remembered that the inception of this most important gathering was the action of a committee at the Buffalo meeting of the American Association for the Advancement of Science, in 1876, the year of the Centennial Exposition. This committee left the work of organizing the first Congress in the hands of a committee of geologists, who thereupon selected as the date of the first Congress the year 1878, which was that of the French "Exposition Universelle." The first Congress was duly held, but its work was of course chiefly confined to sketching a plan for future sessions. After settling some preliminary matters it was decided that the next sitting of the Congress should be held at Bologna, in 1881.

This second session of the Congress was also held; and by that time, the methods of accomplishing the ends of unification in nomenclature and coloring having become better understood, it was determined to undertake to make a map of Europe on a scale of $\frac{1}{1\,500\,000}$. A committee was appointed to take this in hand, and another to devise ways and means of making a consistent nomenclature for the science.

The two committees met at Foix and Zurich during the four years that intervened between the Congress of Bologna and that of Berlin, and the work of the present Congress has been mainly the adoption of the propositions made at these meetings. At the meeting of the American Association for the Advancement of

* See Note 3 at end of pamphlet.

Science at Ann Arbor in August, 1885, Professor H. S. Williams and Professor Persifor Frazer were added to the original committee, constituting the American delegation and actually represented at Berlin by Professors James Hall and J. S. Newberry. Professor Brush, who was in Berlin at the time, was elected by the committee one of its members. The members of the American committee present at the time of the opening session of the Berlin Congress were, Prof. James Hall (President), Prof. J. S. Newberry, Prof. Brush, Prof. H. S. Williams and Prof. Persifor Frazer (Secretary). Mr. W. J. McGee of the U. S. Geol. Surv. arrived after the opening of the Congress. Messrs. Kemp, Miller and Patton, from the United States, also attended the Congress, and are printed in the official list of its members.

The third session of the International Geological Congress met in Berlin, Monday, September 28. The members and delegates arriving before this date registered at the office of the Bureau in the Bergakademie. The council met at 11 o'clock Monday morning to determine upon the programme of the first day and nominate officers of the present meeting, and at 5 o'clock the members of the Congress assembled at the house of the Reichstag for mutual greetings. Only members of the Congress were admitted, and those having registered and received a card of membership were presented with the badge of the Congress, which was in the form of a medal, with the well-known geological and mining symbol of crossed hammers in the center under which are the words "Geologorum conventus—mente et malleo;" and on the reverse—"Berlin, 1885."

First Day, 11 A. M., Sept. 29th.

The formal opening of the Congress took place Tuesday morning, September 20th, at 11 o'clock, at the House of Deputies.

At this meeting, Professor Capellini, of Italy, occupied the chair as President of the Congress at Bologna.

On his right was Dr. von Dechen and M. Hauchecorne, on the left Professor Beyrich and Professor Hall.

On the ministerial benches on the right were the diplomatic and government officers, and on the left the vice-presidents, representing various countries.

Professor Capellini introduced the "Cultus-Minister," Herr von Gossler, who in a German* speech welcomed the Congress to Berlin.

*By the action of the Congress at Bologna the language of its debates is French.

Herr von Gossler dwelt upon the fact that no science could proceed in any direction without calling to its aid the assistance of the other sciences. He noted the advantage which had accrued to astronomy by this course. He reminded his hearers that Prussia had been the home of von Buch and von Humboldt, and in the name of the Prussian government he warmly appreciated the honor conferred upon Berlin by its choice as their place of meeting, and bade them welcome with the miner's greeting "Glück auf.!" He added humorously, that as the facts of geology rest upon the results of the action of water, he knew the weather—(which was very wet)—would not deter the true geologist from his work.

Dr. von Dechen then read his address in French, beginning with thanks to the members for having elected him honorary President. He called to mind the names of many European scientific men of a past generation, specifying among them some of the greatest with whom he had been intimate in Paris, in London and in Germany. He stated that much had been done in Geology since the last Congress at Bologna, and much still remained to be done. After thanking the government for its kind reception of the guests, he concluded by expressing the high appreciation of the people of Berlin of the honor done them by the Congress in meeting in their midst.

Professor Capellini then addressed the Congress. His first words were that he owed the honor of occupying the chair to the fact of his having been chosen to preside over the Congress at Bologna. He sketched the origin and history of the Congress from the time of its inception by the committee of the American Association for the Advancement of Science in 1876, through the Paris sessions in 1878 and the Bologna Congress of 1881, and mentioned particularly the very friendly attitude which his Majesty, the king of Italy, had assumed towards its work and deliberations. He continued: "I had the honor in the month of August last, of communicating to his Majesty, King Humbert, the project of holding the third session of the Congress in Berlin, and his Majesty specially charged me to convey to the officers and members his kindliest greeting, and the assurance of his sincere interest in the result of its deliberations; and further desired me to be the interpreter of his wishes for its complete success. (Hearty applause.) In conclusion I have the honor to announce, that Dr. Beyrich has the floor." Hereupon Dr. Beyrich read from manuscript his address in French. It was an exhaustive history of the development and proceedings of the Congress up to the Bologna session, and also of the successive meetings of the committees on the chart of Europe at Foix and at Zurich. He also gave an account of the meeting of the German committee at Stuttgart in 1883. The meeting of the Congress at Berlin was determined upon for

1884, but was postponed on account of the cholera. The objects of the Congress—the discussion and determination of questions of geological classification, nomenclature and cartography were explained, and a general account of the results already attained was given. He closed by calling attention to the maps and collections in the Bergakademie which illustrated these results.

At the conclusion of the address of Dr. Beyrich, the following list of nominations for officers of the council for the Berlin session was read by Professor Capellini, and the nominations therein made were elected by unanimous vote of the Congress, whereupon Prof. Capellini yielded the chair to Dr. Beyrich.

Members of the Bureau.

Honorary President: Dr. von Dechen.

President: Prof. Beyrich.

Vice-Presidents: Messrs. Credner, Fraas and von Gümbel, of Germany; Stur, of Austria; Dewalque, of Belgium; Johnstrup, of Denmark; Vilanova, of Spain; James Hall, of the United States; Jacquot, of France; Hughes, of Great Britain; Szabó, of Hungary; Blanford, of India; de Zigno, of Italy; Kjerulf, of Norway; van Calker, of Holland; Choffat, of Portugal; Stefanescu, of Roumania; Inostranzeff, of Russia; Torell, of Sweden; Renevier, of Switzerland.

General Secretary: M. Hauchecorne.

Secretaries: Messieurs Fontannes, Bornemann père, Fornasini, Wahnschaffe.

Treasurer: M. Berendt.

Members of the Council: Messrs. Benecke, Dupont, Böckh, Ewald, Frazer, Gaudry, Geikie, Giordano, von Hantken, de Lapparent, Lepsius, Mayer-Eymar, von Mojsisovics, Newberry, Pilar, Platz, Strüver, Topley, Williams, Zittel.

At the opening of the evening session, at 6 o'clock, M. Hauchecorne, the secretary, requested the members to inform the Bureau of any ladies they might have with them, in order that means might be provided for their comfort and entertainment. The first printed list of members was then presented.

The secretary further stated, that catalogues of the museums of science and of arts had been prepared and would be distributed at the close of the meeting. The Prussian minister had provided for the opening of the museums to all members of the Congress, from 9 o'clock till 3 P. M., and certain days were designated when the chiefs, or their representatives, would be present to show and explain their contents.

Reports of the Committees.

Prof. Renevier (of Switzerland), general secretary of the committee on *the map of Europe*, then commenced to read the report of his committee, explaining beforehand that it was not *his* report but the report of the committee which had met at Foix and at Zurich, and deliberated upon the matters referred to them. Although the place and times had been appointed for the discussion of all matters pertaining to the preparation of the geological map of Europe, unfortunately, the committee was not complete at any of its meetings.

The Committee of Direction has made a contract with the house of D. Reimer & Co., of Berlin, which engages to undertake the publication of the map under excellent economic and scientific conditions. The map will be divided into 49 sheets, each sheet of 48 centimeters by 53 centimeters. These 49 sheets united will form a rectangle $3\frac{86}{100}$ meters high, $3\frac{71}{100}$ wide. Professor Kiepert, of Berlin, has agreed to prepare the topographic base, which will be entirely remodeled according to the most recent data that can be obtained. The house of D. Reimer & Co., undertakes the publication at its own cost, on the single condition that the international committee guarantee to it the placing of 900 copies at 100 francs a copy, and furnish it sums on account in advance. The price of subscription is 100 francs, but 125 francs will be fixed as the trade price of the work. This guarantee subscription has been divided as follows. Each of the great States of Europe to wit: Great Britain, France, Spain, Italy, Austro-Hungary, Germany, Scandinavia and Russia agree to take 100 copies each. The six small States, Belgium, Holland, Denmark, Switzerland, Portugal and Roumania, will divide among themselves the last hundred copies.

A promise has been received from each of the above named countries that it will lend its assistance to the committee, conformably to the distribution above, with the single exception of Spain, whose answer has not yet been received. The commission will consider what can be done to obtain this answer.

As to the geological symbolization, it will be furnished naturally by the national committee; each one for its own country, and these contributions will be harmonized by the labor of the Committee of Direction, which, besides, will have the duty of completing the work, by all the data accessible to it, published or unpublished. The chromo-lithographic work will be done by the editors, Reimer & Co., conformably to the international scale fixed at Bologna and completed at this meeting.

The scale of the map was fixed by the unanimous consent of the Bologna Congress, September 29th and 30th, 1881, at

$\frac{1}{1500000}$, at the same time that the map was decided upon, and its execution was confided to eight members composed of:

Messrs. Beyrich, Hauchecorne,	*Committee of Direction at Berlin.*	Germany.
Daubrée,		France.
Giordano,		Italy.
Dr. Möller,		Russia.
Mojsisovics,		Austro-Hungary.
Topley,		Great Britain.
Renevier (*General Secretary*),		Switzerland.

Specimens of the work done on the map were exhibited to the Congress. The greatest progress had been made on those portions under the charge of Germany and Italy. The chart exhibited the wisdom of the decision of the Bologna Congress in expressing the successive subdivisions of the periods by graduated tints of the same color, the deepest tints representing the oldest étages.

At this point, Professor Capellini exhibited a roll that had been handed him as the first installment of the colored map of Italy, made on the scale agreed upon ($\frac{1}{1500000}$). It contained Central and Southern Italy.

M. Nikitin (Russia), reported that an installment of the map of Russia was *en route*, and that it would be exhibited the next day.

In conclusion, the reports offered the following resolutions for the adoption of the Congress:

1st. Dr. Möller, who has resigned, is hereby replaced in the commission by Mr. Karpinski.

2d. The "Carbonic" system (or Permo-Carboniferous), will be represented by a gray color in three tints.

3d. The "Devonic" system will have three tints of brown.

4th. The color of the "Siluric" system is left to the choice of the committee on the map.

5th. The eruptive rocks will be represented by seven tints, from bright red to dark brownish red.

6th. The determination of other questions in the report is left to the discretion of the committee on the map.

This was acted upon section by section. Section 1 was adopted without dissent. Section 2 was then read.

Professor Hughes (Cambridge), objected strongly. He said the discordance between the two formations in England was enormous and that English geologists would never consent to this union.

Professor Dewalque (Belgium), defended the proposal of the committee.

M. Hauchecorne (Germany), urged that the gray chosen by

the committee for the Permian was a greenish gray very different from that of the Carboniferous, and he believed that if Professor Hughes would look at the map as made, he would find that all the distinction he desired was accomplished by this tint. His view was that a distinction of two entirely different tints of the same general color base would effect as complete a representation of the difference between the two series as could be effected by totally different colors.

M. Nikitin (Russia), thought the Carboniferous ought not and could not be joined to the Permian, and discussed the case of the so-called transition beds in Nebraska and elsewhere in illustration of the view.

Professor Renevier (Switzerland), thought the Culm, Carboniferous and Permian really constitute one system, but in order not to prejudice the case he had invented the term "Carbonic." Section 2 was then adopted. It was voted that the Carboniferous and Permian be colored in different tints of gray.

Prof. Dewalque (Belgium), objected to the use of the term Siluric in the 4th section, on the ground that the question of the limitation of the Silurian was to be brought up hereafter.

Prof. Renevier said he had used the term "Silurique" in order not to bring up the Silurian question, and moreover, he had said "Siluric, Cambrian included." He called the attention of M. Dewalque to the fact that it was impossible for him to discuss things without applying to them names, but that he did so in a manner that he thought would commit the committee and Congress in the least possible degree.

Professor Hughes energetically protested against the use of the word "Siluric." He had not found the Cambrian in the region of the Silures.

M. Jacquot (France) allied himself warmly with Professor Hughes in protesting against the use of the term Silurique, at least for the measures in France. One can recognize distinctly the difference between the Silurian and Cambrian in every part of the extended contact in this country, in the Pyrenees and in various other places they are never to be confounded.

Professor Renevier said, it is not a question of confounding them, but it is simply a question of using one general color-base for a column of measures which have certain points of analogy and are usually found together. They could be easily distinguished from each other by differences of tint or other means.

M. Jacquot replied that he could not see any reason for uniting two things that are distinct.

M. Hauchecorne (Secretary), said: "Gentlemen, we must get on, and I ask as a personal favor on behalf of the committee on the map of Europe, that the members repose a certain amount of confidence in it. It is not intended to prejudge any question or

force upon the delegates any views other than those they desire to support." He suggested that the fourth article might be so altered as to allow the committee to adopt provisionally according to their choice, a scheme of colors for convenience, and that this choice should not decide the scientific question connected therewith at all.

M. Jacquot accepted the suggestion of the Secretary, and thereupon section 4 was adopted.

5th. The eruptive rocks shall be represented by seven tints ranging from dark to light red. Carried.

6th. The solution of other questions that might arise were referred to the committee on the map for decision. Carried.

M. Choffat (Portugal) said that in joining the Callovian to the Malm, a union is made which is opposed by all palæontological and petrographical evidences. It should be joined to the Dogger.

M. Hauchecorne stated that in his opinion the objection was too much a matter of detail to be brought before the Congress at this time, and he appealed to M. Choffat to withdraw his objection.

M. Choffat replied that, in doing his work in Portugal, it was impossible for him to take this view of the two series.

M. Hauchecorne again appealed in the name of the committee to M. Choffat, to withdraw his objection, stating that the committees on the maps of Europe and of Portugal would have ample time to consider and adjust all these points of difference. No definite action was taken.

M. Hauchecorne then announced that the council would meet at 11 A. M. and the Congress at 2 P. M. on Wednesday. The first two hours of the session would be devoted to business and the last two to purely scientific discourses.

SECOND DAY, 2:30 P. M., SEPT. 30TH.

At the request of Dr. Beyrich, the Honorary President, Dr. von Dechen, took the chair. The Secretary then made announcements in regard to excursions, and stated that the Congress until 4 P. M., would discuss the report of the committee upon the map of Europe. Afterwards it would listen to lectures upon special subjects: M. Gaudry upon certain reptiles, and Dr. Newberry (of New York), on some new fishes from the Devonian.

The Secretary further announced the gifts which had been presented to the Congress.

Prof. Dewalque began the reading of the report of the Committee upon Uniformity Nomenclature at page 13: A. Archæan System, Nos. 1, 2 and 3. "The first question to settle is, whether it should be included under the Palæozoic. The negative of this

does not seem doubtful. Consequently and in conformity with the proposition of the French report, we propose to the Congress to decide that this system shall form a group to be known as the *Primitive* group. The termination of the word primitive will recall the characters which distinguish it from the groups '*primary, secondary,*'" etc.

Dr. Blanford proposed that we postpone the question of forming such a group till a later occasion.

Professor Hughes did not think that we had found the bottom of this group, and therefore we should wait for the determination of the term to be used, whether group or system. He called attention to an error in the report by which it would seem that the English committee prefers the term *Pre-Cambrian.* The English prefer the term *Archæan* to *Pre-Cambrian,* and they have used the former term.

Prof. Dewalque said if this group be not accepted, it must belong to the Palæozoic. [Loud objections.] Mr. Dewalque replied there was no way of avoiding the dilemma.

Professor Hughes thought we might represent it as a part of an unfinished system, but not as a system or a group.

Prof. de Lapparent (France) said if the Congress is willing to decide that there are no fossils in the Archæan, it should be set apart; if it contain fossils it must be joined to the Palæozoic.

Prof. Renevier proposed the term *Terrane* to avoid pre-judging the question of the rank in the classification of these rocks. He objected to the use of this term in any systematic sense, but believed it might be employed in a general sense.

Dr. von Dechen said, we want the terms "group" and "system" used for the map, and do not want any vague terms. He believed it was necessary to maintain the usage of terms as adopted by the Congress at Bologna.

Professor Hughes suggested that the use of the term *group,* for the Archæan be adopted, without settling its subdivision into systems, or attemping any correlation between subdivisions in different countries.

Prof. Renevier replied that we do not apply to eruptive rocks, the words "group" or "system," but simply "rocks." If eruptive rocks require no classification further than this, the words and coloration are sufficient for the Archæan.

Dr. Beyrich said that all that was necessary at present was the acceptance of the Archæan as anterior to Palæozoic time.

M. Stefanescu proposed the term "group" for all the rocks preceding the Palæozoic. His question was, "Shall we say Archæan 'system' or 'group?'"

M. Firket said there were two questions involved:

1st. Archæan or Primitive? 2d. Group or system?

Prof. Dewalque spoke to the same effect.

Dr. Hauchecorne asked for a vote on the terms "group" or "system." "Group" was chosen.

The vote was then taken on "Archæan" or "Primitive." "Archæan" was adopted, after M. Renevier (General Secretary of the committee on the map of Europe), had explained his views upon the question.

Prof. Dewalque proposed that some member should make a motion to divide the Archæan into three parts.

M. Hauchecorne asked M. Dewalque to make some proposition in order to bring the question before the Congress. No action was taken.

He stated that it was proposed to subdivide the Archæan into Azoic schists, Crystalline schists, and Portogine schists.

Professor Hughes suggested that it would be better to express the petrographic character and not divide the group chronologically. To this M. Renevier agreed.

M. Jacquot stated that no division of the Archæan in France was possible at present. The work of M. Lory in France and in the Alps results in establishing, as the best procedure, the coloration of mica-schists and gneisses in the same manner. He also supported Prof. Hughes's proposition.

M. Firket agreed to the petrographic divisions, but objected to the term "Azoic." It begs the question of the existence of life.

M. Stefanescu stated that the Archæan is well represented in Roumania, but there was extreme difficulty in making subdivisions.

Prof. de Lapparent respectfully requested that the term "Protogine" be suppressed once for all, and gave his reasons. A vote was taken and the term was suppressed.

The proposition of Professor Hughes was then adopted, viz.: to accept the Archæan as a group, leaving the petrographic divisions to each geologist and not assigning to them any chronological value.

The question then taken up was B 4, 5, and 6 (p. 14 of the Committee's report), as follows:

The conference at Zurich has provisionally admitted the union into one system (for which it remains to determine a name), of the different beds, corresponding to the Cambrian and Silurian of the British Isles. The French, Portuguese and Roumanian committees propose the name of *Silurian System*. Before voting on the proposition, the Congress will first have to pronounce upon the names to be given to the three groups, and then on their union into one or two systems. The Hungarian Committee proposes a *Cambrian* and a *Silurian* system; this latter comprising the groups 5 and 6 united. The Belgian Committee would have proposed an analogous association, if it had not preferred to con-

form to the decision rendered at Zurich by a large majority. The French Committee does not propose any name for the three groups. The Roumanian Committee designates them by the inadmissible names (these must be univocal), "lower, middle and upper." The Belgian Committee proposes the names Cambrian, Ordovician and Silurian. The Portuguese substitutes for the latter term '*Bohemian.*' We have already recalled that the English Committee has not been summoned to decide upon the questions of the report which have been submitted to it."

Since the receipt of the reports of the national committees, the question to be decided has become complicated. M. Jules Marcou, in an important work published by the American Academy of Science and Arts, and entitled "The Taconic System and its position in stratigraphic geology," has vindicated the priority of the term *Taconic* of which the *Cambrian* above mentioned (of Primordial fauna) would be the equivalent. To us the question seems to be demonstrated. In such a case the term Cambrian would be employed to replace the Ordovician, the name Silurian would come back by right to group 6. If we be not in error this solution would avoid many difficulties. We propose, then, to the Congress to determine first, the names that the groups 4, 5 and 6 should bear. It will afterwards have to decide whether they constitute one or two systems; and finally the name or names to be employed.

Dr. A. Geikie proposed that the Congress postpone the subject of subdividing the Cambrian and Silurian until the meeting in England; on the ground that the Silurian question was mainly an English question. (Loud murmurs.) Professor Hughes agreed with Dr. Geikie as to the propriety of postponing the discussion of these questions, and said that Professor Hall had also expressed his approval of this course.

The chairman, Dr. von Dechen, put the question to divide the Silurian, but leave the names till the meeting in England. Prof. Capellini regretted such action, if it would postpone the completion of the European map. M. Hauchecorne said it would not, as the map could be completed without waiting for the determination of the names.

The motion was then put and carried.

The Congress then took up the Devonian. Prof. Dewalque continued reading that part of the report in regard to the Devonian (pp. 15, 16), numbers 7, 8 and 9. (*a.*) Conformably with the only propositions that have been made, the Congress is requested to decide that the three series of this system shall bear the names respectively of the *Rhénan*, the *Eifelian*, and the *Fammenian.*

(*b.*) We propose to it to decide that the Calceola beds should form a part of the Eifelian series.

(c.) Finally we propose to the Congress to decide that the upper limit of the Devonian system is to be placed at the base of the Carboniferous limestone; that is to say, that the system comprises the psammites of Condroz, the lower Carboniferous, (Kiltorkan, Marwood, Pilton) the upper 'Old Red' or the Calciferous sandstone (Dura-Den), etc.

Prof. Renevier asked why the Coblentzian was called Rhénan. M. Lapparent explained that Coblentzian was used in a more restricted sense.

M. Dupont proposed that the upper Devonian begin with the zone of *Cyrtia Murchisoniana*. Dr. Beyrich remarked that few in Germany would agree to this classification.

M. Renevier desired to say that M. Gosselet, whom he had expected to see here, regarded the junction between the Calceola beds and the Stringocephalus beds as forming the division between the lower and middle Devonian.

M. Dupont remarked that such was the classification of M. Gosselet some time ago. Much had been done since.

Dr. von Dechen said the Calceola beds should be in the middle Devonian.

The third section of the Devonian (in regard to its upper limit) was then read.

Dr. Geikie said that an error had crept into this clause and he proposed to strike out all after the word 'Condroz' except the words "the Upper Old Red."

Prof. Renevier objected to sharp lines. We should not go into such details and he asked for the striking out of the clause on principle.

Prof. Capellini said if it was necessary for the coloration of the map he would retain it, but it did not seem to him to be necessary.

Prof. Dewalque thought it was necessary to make sharp distinctions in the map as to the beginning and ending of series, otherwise how was it possible to compare corresponding series in different countries? The limits must be at the same horizon for all regions recorded on the map.

Prof. Capellini proposed to adjourn the decision of fixed limits, because it was not necessary to the coloration of the map.

M. Hauchecorne was of M. Dewalque's opinion.

Dr. Beyrich thought that we could not separate the Devonian from the Carboniferous at an absolute horizon.

Prof. Renevier said this was necessary in important cases but was not important here.

Prof. de Lapparent remarked that if the geologists of England are content to sit still and make no objection to the proposed limitation, the Congress would save much trouble by permitting it to be accepted, because the English are most interested in it.

At the close of the discussion the clause (*c*) was amended in accordance with Dr. Geikie's resolution.

Several scientific papers were then read, among them one by M. Gaudry on some fossil reptiles, and another by Dr. Newberry on some new Devonian Fishes.

THIRD DAY, OCT. 1ST, 2:30 P. M.

The session opened with Dr. von Dechen in the chair. M. Fontannes, secretary, read the minutes of the last two meetings, after which Prof. Dewalque continued the reading of the report of the committee on unifying the nomenclature. Professor Capellini read a telegram from the Syndic of Bologna as follows: "Bologna, proud of having been the seat of the second session of the International Geological Congress, sends an affectionate greeting to the illustrious savants assembled at Berlin, and hopes that their works will aid the progress of civilization."

M. Hauchecorne then announced the scientific memoirs which would be presented at 4 P. M. Among them were,

de Szabó: On the new map of Schemnitz.

Mayer-Eymar: The perihelions of the Globe and the sedimentary rocks.

Reusch (Norway:) 1. Exhibition of a meteorite which fell in Norway in 1884, with some observations on meteorites in general.

Reusch (Norway:) 2. Exhibition of specimens and charts illustrating the phenomena of pressure and tension in metamorphic rocks.

Taramelli: On chemical deposits.

This was followed by a list of the donations of memoirs, etc., to the members of the Congress and to individuals.

The announcement of the trips to Thale, Leipzig and Stassfurt were so modified as to enable those members who desired it, to proceed directly on Wednesday to Dresden instead of remaining to make the geological excursions with Professor Credner. These would go to Dresden under the guidance of Geheimrath Professor Geinitz, and on Thursday visit the Natural History Museum of the Zwinger, and afterward the collections of the Royal Gallery. Thursday evening they were to reassemble on the Brühlische Terrasse, and the next day to spend the time in inspecting the collections of Dresden. They will reassemble on the Belvidere on Friday evening. [This programme was carried out with some modifications.]

The continuation of the Report of the Committee on Nomenclature was then proceeded with by M. Dewalque at p. 15. D. the Carboniferous System.

Prof. de Lapparent took the floor and supported the proposition of the committee to unite the Permian with the Carboniferous.

His ground was that every classification should base its horizons upon established fauna. The cephalopods of the deposits anterior to the Tertiary terranes furnished an excellent means of forming homogeneous groups, but this means only commenced to be easily applicable with the Trias. Nevertheless, if one considers the Pelagic Faunas of the Carboniferous and of the Permian, not only do they show themselves to be intimately connected, but no one among those who are acquainted with the Pelagic Permian will ever be able to establish sub-divisions in it. Now, that which distinguishes *systems* is that they are groups susceptible of being sub-divided. The Permian, then, cannot form a system by itself. It cannot be but an étage in the great Permo-Carboniferous system. He concluded, "I believe that in establishing the Permian as a unit we construct something which has nothing in common with the characters adopted for other units; which has no distinctive characters of its own; and which in fact does not exist. Whereas joined to the Carboniferous we have two distinct horizons of faunas, each of which is susceptible of further subdivision by pronounced differences in character.

Dr. Beyrich made some observations.

Mr. Jacquot thought that Prof. Dewalque should read to the Congress the opinions that had been expressed by the different national committees. This would have, in his view, the most capital importance in deciding the question.

Prof. Dewalque conformably to the request of the last speaker, called first upon the French committee.

Prof. de Lapparent did not think that his opinion should be brought into conflict with that of the French committee, to which as a member his name was attached.

Prof. Renevier spoke on this question.

M. Choffat, in the course of his remarks, insisted that the question of the thickness of measures was an entirely insignificant one.

Prof. Capellini read the report of the French committee and observed that M. de Lapparent may very well present his own views in the Congress, even though they be different from those of his committee.

Prof. Hughes (exhibited a section) made by himself. There was a large gap between the Permian and the Carboniferous; still the amount of time to be ascribed to that gap is different in different places, and no doubt if the contact line could be every where examined, places would be found were the two systems would approach each other very nearly. As at the base of the Carboniferous also, there is an enormous break of at least 27,000 feet of measures that had been eroded before the present discordant contact was effected. That between the Permian and Carboniferous represents also an enormous lapse of time. In reply to the argu-

ment from the percentage of fossils common to the Carboniferous and Permian, he observed that the number of fossils, which are found in a given neighborhood depends both upon the excellence of the geologists looking for them and the assiduity of their search. The percentage of fossils common to the Palæozoic and Mesozoic is increasing every day in proportion to the hammering done.

M. de Lapparent was of the opinion that the arguments for establishing these étages should be pelagic traces rather than geographic situations. He continued, that if we could restore the geographical divisions of the world as they were at the time when these various groups were laid down and the Carboniferous and Permian did not present analogies which could be made out, he (de Lapparent) would acknowledge himself in error, but the same argument could not be drawn from the present geographic conditions of the earth. He would cite, however, another argument, namely that from petrographic studies. The *same eruptions* which took place during the Carboniferous epoch were followed during the Permian epoch, of which the porphyries and melaphyres were the incontestable continuation of the porphyritic and trappean rocks of the Carboniferous; that, in consequence, the Permian epoch was the termination of the "Primary eruptions."

Dr. Beyrich made some remarks. Another member of the Congress, stated that the Rothliegendes must be separated from the Carbonic and also from the Triassic.

The Hon. President, von Dechen, said that the Rothliegendes was a very remarkable group. It has the thickness in some places of 1,600 meters, and even at this depth the bottom is not found. Rothliegendes and Zechstein occur over vast extents of country. In Russia there are outcrops of it larger than the whole of some countries existing in Europe.

Dr. Blanford said: "In taking up this question we take up one that concerns many parts of the world. Outside of Europe there is no Permian—I mean no European Permian. It is impossible to separate the upper from the middle and lower Carboniferous. I believe that the fauna of the Zechstein is a local fauna and therefore I give my adhesion to the views of M. de Lapparent as to uniting the Permian and the Carboniferous."

Prof. Capellini, rising with the report of the committee at Zurich in his hands, remarked that there must be some mistake in the printed report inasmuch as it was there stated that Dr. Blanford was of the opinion that there was an evident division between the Carboniferous and Permian.

Dr. Blanford stated that the report was entirely correct and that he would explain how the misunderstanding arose. He was under the impression, during the discussion at Zurich, that the

question was simply of European geology—and in the vote that was taken he had no part.

M. Stur (receiving permission to address the Congress in German) made some observations on the course to be pursued in treating these two formations. He believed in uniting the Permian and Carboniferous in one system.

M. Nikitin: "We have two regions in Russia where we have studied these groups. They are divided into two étages. In central Russia, in the Volga valley, we can distinguish them, but at the foot of the Ural mountains we cannot. We cannot at the present time, even in Eastern Russia, accurately define the limits between the Carboniferous, Permian and Trias, but no doubt in the future we shall be able to do so."

Prof. Renevier was glad to hear from Mr. Stur's remarks the confirmation of views which he had always held and often expressed, namely: that the classification based on gaps is false and artificial. I agree with M. Nikitin, that our groups are all artificial. (Dissenting murmurs.) Oswald Heer called the Permian Upper Carboniferous by its flora. And as to the fauna he has shown a great number of species that are similar. M. Gaudry has done the same for the reptiles; M. Fritsch's views tend in the same direction. The divisions ought to be made on palæontological evidence.

Dr. Newberry said, the question before the Geological Congress had special reference to the preparation of the geological map of Europe, and it might be considered an impertinence for a member of the American delegation to take part in the discussion, but reference had been frequently made to the so-called Permian of North America, and he had been requested to express the opinion of Prof. Hall on the subject, which was that no true Permian had been found in the United States.

Dr. Newberry also said that his own observations confirmed those of Prof. Hall. He had traversed all the States and Territories of the Union, and had examined the so-called Permian in many localities, but, in his judgment, it could not be separated from the Coal-measures.

It is true that in the upper Carboniferous strata certain genera of mollusks appear, which are regarded as characteristic of the Permian, such as *Monotis*, *Bakevellia*, *Pleurophorus*, etc., but these are associated with and outnumbered by the most characteristic coal-measure forms, such as *Spirifer cameratus*, *Athyris subtilita*, *Productus semireticulatis*, etc., and were by these inseparably bound to the Carboniferous system. On the other hand, the characteristic fossils of the Permian of Europe, *Voltzia*, and *Ulmannia* among plants, *Pygopterus Acrolepis*, and *Amphicentrum*, among fishes, and the exclusively Permian mollusks had never been found in America. Hence, the Permian, properly so called,

as far as now known, did not exist in North America. He also said that the Trias of the eastern part, at least, of the United States represented the Rhætic or uppermost member of the series, the Muschelkalk and Bunter being wanting. Thus a hiatus existed in our geological history, a blank between the Upper Coal-measures and the Upper Trias, and in this hiatus the true Permian of Northern Europe was perhaps deposited. "Therefore, for America (and only for America I speak), the Permian as a separate division does not exist."

Prof. Capellini: "The president asks me to see what can be done to advance the map, and although it appears to me that a majority of those present is in favor of joining the Permian and Carboniferous, still there is a respectable number of those who are opposed to it. And therefore the commission on the map would propose to adjourn the discussion and definite settlement of this question until a future time.

M. Topley said: "Dr. Blanford speaks only in general terms and not for England in the matter of these groups. It is highly important, as well for the classification as for the economic geology of England, to preserve the identity of each system. He agreed with Professor Hughes in drawing a strong line of demarcation between the Permian and the Carboniferous.

Prof. de Lapparent said: I ask the Congress to give the statements made by Professor Newberry and Dr. Blanford, in regard to the absence of the Permian in various parts of the world, the attention that they deserve. It seems to me that the object of this Congress was to establish a system applicable to all the world and not to Europe alone, or it should not have invited geologists from other than European countries to participate.

Prof. Capellini remarked that these matters were to be settled as broad and grand questions in Science—without paying too much attention to individual matters of detail in which different countries might differ.

Prof. Neumayr thought that just because the questions were grand and broad they should be left to the free and unrestricted discussion of scientific men in the journals and societies of the world, and not be settled by a majority which changes with every country, and after the address of every eloquent orator.

Prof. Capellini made some further observations. Professor Hughes said that Professor Newberry and Dr. Blanford had stated that there was no Permian in America and India, but that they had simply found fossils having a Permian facies in the Carboniferous. He concluded by expressing the belief that it was better to leave the question open.

M. Hauchecorne: I agree entirely with the views of Professor Hughes as to the scientific aspect of the question, which we propose to leave to the future. But in the map we will arrange the

order of the beds provisionally as it is in the proposed chart of colors without uniting the two systems in the legend of the chart by a bracket.

The Hon. President von Dechen agreed with the views expressed by Prof. Neumayr and desired the map to go on to its completion at the earliest moment.

Prof. Dewalque: "I propose the following as expressing the opinion of the Congress on this subject:"

"The Congress not wishing to pronounce any view on the scientific question of the proper division of the Permian and Carboniferous, preserves the classification as it now is" (Adopted with about fifteen dissenting votes).

FOURTH DAY, OCT. 2d, 2:30 P. M.

The Congress assembled in the Reichstags chamber and Prof. Capellini occupied the chair as chairman *pro tem.*

The report of the Council was read and the nominations proposed by it for the Committee on Uniformity of Nomenclature were voted upon and unanimously elected. They were as follows in alphabetical order (in French) by countries:

Germany,	Römer.	India,	Blanford.
Austria,	Neumayr.	Italy,	Capellini.
Belgium,	Dewalque.	Japan,	Neumann.
Canada,	T. Sterry Hunt.	Norway,	Kjerulf.
Denmark,	Johnstrup.	Holland,	van Calker.
Spain,	Vilanova.	Portugal,	*Choffat.
United States,	James Hall.	Roumania,	Stefanescu.
France,	de Lapparent.	Russia,	Inostranzeff.
Great Britain,	Hughes.	Sweden,	Torell.
Hungary,	Szabó.	Switzerland,	Renevier.

The members of this committee were requested to vote for a president for the next meeting.

M. Fontannes read the journal of the preceding session, which was approved.

Prof. Capellini, in the chair, then took up the question on which the Congress was engaged at the close of the last session, and asked if any one wished to speak further upon giving three divisions to the Trias. After a pause, Prof. Renevier remarked that he did not wish to take up the time of the Congress, but he wanted to know how it is intended to color the Trias. Is it intended only provisionally to accept the divisions for the map or not?

*M. Choffat declined the appointment in favor of M. Delgado, chief of the Geological Survey of Portugal.

M. Stefanescu said the proposition to accept the divisions of the map prejudges the whole question.

Prof. Dewalque, Dr. Blanford, and Prof. Capellini further discussed the question, and finally the three-fold divisions of the Trias proposed at the Zurich meeting was agreed to. . . . .

The question as to the proper place of the Hettangian beds (whether with the Trias or with the Lias) was discussed but no decision was reached.

It was decided to divide the Jurassic into three parts.

The question of the union of the Rhætic, not including the Hettangian, with the Lias or Trias was again discussed.

M. Hauchecorne observed that the scale of colors and symbols were so arranged that the Rhætic could be classed with the Trias or Lias to suit the observer. The question as to the upper limitation of the Lias with the zone of *Ammonites opalinus* was discussed.

M. Choffat thought that so little of this series is known in Europe that the limit should be left for each geologist to place it at his own discretion. Agreed to.

When the Tertiary was taken up, an animated debate ensued, in which Prof. Meyer-Eymar, of Zurich, Dr. Beyrich, M. Stefanescu and Prof. Neumayer took part.

Finally the chairman, Prof. Capellini, proposed that, in view of the fact that no progress seemed possible owing to the divergence of views maintained, a vote of confidence in the committee on the chart be taken; assuring the members of the congress that the committee would exhaust every means to satisfy the views of the different members. (This vote of confidence was carried unanimously.)

The proposition in regard to the Eruptive Rocks was then taken up.

Professor von Dechen declared that there should be no distinction made between the rocks of extinct and of active volcanoes, or between ancient and modern eruptive rocks, but there should be a strong distinction drawn between ancient tuff and ancient eruptive, and between modern tuff and modern eruptive rocks proper.

Dr. Beyrich agreed with his Excellency Dr. von Dechen, on this point.

Dr. Blanford said it should be taken into consideration that in parts of England, in the Hebrides, in parts of America and elsewhere, there were eruptive rocks, and lavas which resembled stratified rocks very closely He objected to the petrographic division of the eruptive rocks, while the sedimentary rocks are divided chronologically; the more so, as many of the eruptive rocks, like those he has instanced, strongly resemble the stratified rocks.

The whole matter was finally left to the committee on the map.

The president pro tem. then passed to the second order of business, and gave the floor to Prof. Neumayr, who read the report upon the proposed plan for the preparation of his Nomenclator Palæontologicus.

Fifth Day, Oct. 3d, 10 A. M.

At the morning session several scientific papers were read. Among them was a report upon the system of coloration in use in the United States Geological survey. Mr. McGee, who had prepared this report, did not arrive till some time after the opening of the Congress. The paper was presented to the council in English, but the rule requiring all the communications to the Congress to be presented in French, necessitated the preparation of an abstract in that language. This abstract, at the request of Mr. McGee, was presented to the Congress by Dr. Frazer, together with prefatory and explanatory observations regarding the map which was displayed, pointing out the principal features of the system.

At 2.30 P. M. the sixth and closing session of the Congress was called to order. The journal of the last sitting was read and approved. M. Hauchecorne made several amendments.

Three sheets of the map of Galicia were presented, with a letter from their author, Professor Szajnocha. A letter was received from M. Abich, stating that he had returned to St. Petersburg and had resumed his labors.

Prof. Capellini (Pres. pro tem.) called attention to the Nomenclator Palæontologicus, of which Prof. Neumayr had given description yesterday, and recommended that it be published under the auspices of the Congress and under the editorial direction of a committee, consisting of Messrs. Gaudry, Neumayr, Zittel and Etheridge, with power to add to their number. (Carried.)

Prof. Vilanova then mounted the tribune and asked assistance for his polyglot dictionary of geology, a Spanish-French specimen of which he exhibited.

The committee on the formation of an International Geological Society, and of an International Geological Journal, reported, and a letter was read from M. Gregorio of the committee favoring the plan; whereupon the President pro tem., Prof. Capellini, stated that upon consideration of the report and the facts, the council had decided against the advisability of both plans.

Baron Levi asked an explanation. Prof. Capellini stated that no reports could be made to the Congress, unless previously recommended by the Council, and explained that it was not intended to slight the proposition of his countryman, whose acts and motives were warmly approved and appreciated, but simply to adjourn the question till the meeting of the next Congress. Upon this a vote was taken upon the action recommended by the

Council, viz.: favoring the scheme of an International Geological Journal, provided it were undertaken by private enterprise; and it was approved. The President pro tem. then announced that the second part of the programme would be proceeded with and gave the floor to M. Nikitin, who explained the work he had done on the portion of work in Russia committed to his care, viz.: Central and South-East Russia, including the basin of the Volga.

On the conclusion of M. Nikitin's remarks, M. Vasseur took the floor and exhibited thirteen sheets of the geological map of France, prepared according to the principles adopted at Bologna. M. Hauchecorne, the general secretary, stated that it was a pity that the legend of the Russian maps should be printed in characters which people of other nationalities could not understand, and he asked that a copy of each map should be furnished with the names in French characters. M. Nikitin replied that every sheet that he had exhibited contained the names of all the important places and all the rivers and streams in French characters, and demonstrated that this was the case.

Prof. Posepny read a treatise on the fluid condition of the interior of the earth. M. Ochsenius presented his views on the origin of salt deposits and gave diagrams and explanations, claiming analogies between certain chemical and physical conditions in the Caspian and the German oceans and the results of explorations to be seen in the mines at Stassfurt and elsewhere.

Prof. Capellini (President pro tem.) then announced that the hour had come to draw the Congress to a close.

It was time to determine the place of meeting of the 4th Congress of 1888. The council had to propose that the next Congress be held in the year 1888, between the fifteenth day of August and the fifteenth day of September; that London be the place of meeting and that Messrs. Geikie, Blanford, Hughes, and Topley be the committee to prepare for its proper reception. Professor Hughes thought it had been very appropriate to cede to Germany the place of meeting of the present Congress, and its success had justified his opinion. He repeated his statement made to the council, that he had a petition signed by one hundred and thirty-seven English geologists requesting the next Congress to meet in England. This petition included the names of the Duke of Argyle, the Earl of Enniskillen, and some of the most eminent geologists of England; and he hoped that England would be chosen as the next place of meeting.

Dr. Geikie expressed the same views and said that English geologists follow the action of this Congress with the greatest interest, and would unite in giving it a warm reception.

The recommendation of the council was approved.

The acting president, Prof. Capellini, yielded the chair to the president, Dr. Beyrich. Prof. Capellini then took the floor and

said: "Before parting, thanks were due to certain august personages and societies and individuals, naming His Majesty, the Emperor of Germany; the Prussian Government, and especially the Minister of Public Works, and the Cultus Minister who opened the Congress with an able address, the Academy of Mines, his Excellency Dr. von Dechen, Dr. Beyrich, and M. Hauchecorne." (Applause.)

Dr. Beyrich observed that in the last words he had to address to the Congress, he begged to be permitted to speak in the language in which he thought. He thanked the Congress for its kind assistance and support, and introduced his Excellency, Dr. von Dechen.

The honorary president remembered well the first scientific Congress held in Berlin in 1858, under the auspices of the Baron Alexander von Humboldt. Berlin was then a small town but had grown enormously since. He concluded by hoping that all the members would return to their homes with an agreeable souvenir of their sojourn in Berlin.

M. Hauchecorne, the general secretary, spoke of the eminent service of Prof. Capellini, and concluded with the hope that the friendships made here would endure and be the more closely knit at the future session to be held in London.

Prof. de Lapparent mounted the tribune and expressed, on behalf of the members of the Congress, their sense of obligation to the German committee of arrangements. Geological questions, he said, were of a kind to be settled on the spot, and geological brethren mutually dug in the earth and divided the debris in a christian spirit. While here in Berlin, our intellects, our artistic tastes, and our capacities for pleasure have all been considered. Honor to the noble science of geology, which can induce intelligent men such as our hosts, to provide for the dead fossils from the earth's crust mansions as superb as the residences of kings. (Applause.)

The Congress was thereupon declared adjourned.

Report

on the

Geological Map of Europe

presented to the Congress in the name of the

International Commission

by the General Secretary, **E. Renevier.**

Gentlemen and honored confrères!

The International Congress of Bologna, in its sessions of the 29th and 30th of September, 1881, decided in favor of undertaking a geological map of Europe on the scale of 1 : 1,500,000th; and confided its execution to a commission of eight members, composed of Messrs.

Beyrich, **Hauchecorne** } forming the direction at Berlin } **for Germany.**
Daubrée, representing **France.**
Giordano, " **Italy.**
De Moeller, " **Russia.**
Mojsisovics, " **Austro-Hungary.**
Topley, " **Great Britain.**
Renevier, general secretary, representing **Switzerland.**

As it had been arranged at Bologna, this commission assembled in 1882 at **Foix**, and in 1883 at **Zurich**, to settle several questions relative to the execution of the map. I will treat of this afterwards. In these first two sessions, unfortunately, it

was not complete, but a sufficiently large majority was present to be able to deliberate in several consecutive sessions, partly alone, and partly in conjunction with the Committee on Nomenclature.

Since then the commission has learned that Mr. DE MOELLER, having to leave St. Petersburg on account of being called to other appointments in the Ural, has resigned his membership of the commission. Consequently we are obliged to ask the Congress to have the kindness to replace MR. DE MOELLER by Mr. **Karpinski**, his successor in the direction of the geological map of Russia.

I have to announce to the Congress successively:

I. The conditions of publication of the map.

II. The progress of the work on the topographic base.

III. The decisions and propositions of the International Commission for the geological representation.

These will be the divisions of my report.

I. Conditions of Publication.

The direction has made a contract with an editor of Berlin, the house of D. REIMER & Co., which takes charge of the material part of the enterprise under excellent scientific and economical conditions. The map will be divided into 49 sheets (7×7), of 48 centimeters by 53 centimeters on the sides. These 49 sheets bound together will form a rectangle of 3.36 meters high, on 3.72 meters wide. Professor KIEPERT, of Berlin, has undertaken to prepare the topographic base, which will be entirely re-made from the most recent documents that can be procured for him.

The house of D. REIMER & Co. takes upon itself the publication at its own expense, on the one condition that the International Commission will guarantee the sale of 900 copies, at 100 francs a copy, and furnish sums on account in advance. The price of

subscription of 100 francs will be thereafter raised to 125 francs as the library price. The commission has divided as follows this guarantee subscription: Each one of the 8 great states of Europe (France, Spain, Italy, Austro-Hungary, Russia, Scandinavia, Germany, and Great Britain), engages to take 100 copies. The 6 small states (Belgium, Holland, Denmark, Switzerland, Portugal, and Roumania), divide among themseves the remaining 100 copies.

Each of the states above named has promised its assistance conformably to the above distribution, with the exception of Spain, whose answer has not yet arrived. The commission will see what is best to do to get it.

As to the geological representation, it will be furnished by the National Committees, each one for its own country, and harmonized by the care of the Direction, which, besides, will complete the data by all accessible documents, published or unpublished.—The chromo-lithography will be executed by the editor conformably with the international color scale decided upon at Bologna and completed in our present session.

II. Topographic Base.

The work confided to Prof. KIEPERT is reasonably advanced. Of the 49 sheets of the map 32 are finished and engraved; 29 of them have been united in one panel so that the Congress can judge of the effect. It is undoubtedly to be regretted that the scale is so small that we cannot represent the relief of the ground, but this would have much increased the cost of the map and prevented, to a certain degree, the application of the colors. You can judge, gentlemen, of the delicacy and of the neatness of this work by the strip that is before your eyes.

Several points now remain to be determined upon before the printing of these sheets can be accomplished. The following are the principal ones:

I. Ought the names of localities to appear in extenso, or at least those of the principal cities, or regions? Or shall we content ourselves with only their initials?

II. Shall the glaciers appear on the map? And how shall they be represented?

III. Shall the shore lines be marked by a hachure of any kind?

The Commission on the map will have to decide upon quite as many questions during the session at Berlin. As to the other sheets of the South and East which are still missing, work is now being done on some of them, but for several the geographical materials are wanting. This is the case particularly for the east of Russia, Asia Minor, and several places in the north of Africa. I hope that the members of the Congress who are in position to do so, will not fail to help the Commission to procure these documents.

III. Geological Representation.

As to the geological work it is much less advanced, we will even say that it is less advanced than we thought it would be. That is essentially the fault of the National Committees, of which several have not yet sent the materials they ought to furnish.

The most advanced parts of the geological map, are essentially Germany and Italy. We may consider as ready for the chromo-lithography, the following countries: **Prussia, Saxony, Hesse-Darmstadt, Wurtemberg, Baden, Alsace-Lorraine, Luxembourg,** and **Italy. Bavaria** can be easily reduced from the recent works of Mr. v. GUEMBEL. **Austria,** from the latest general map by Mr. DE HAUER. **England** and **France** are partly reduced from the detailed maps of those countries, and these maps partly finished have just been presented to us at Berlin, etc.

It is by means of those materials which have been for some time in the hands of the Direction, that Mr. HAUCHECORNE has been

able to have colored by hand according to the conventional color-scale agreed upon and voted at Bologna, the two central sheets C.IV. and C.V., that you have before your eyes. These two sheets united, though incomplete, give you an idea of what the whole of the map will look like. It shows in a very clear manner that the Congress of Bologna was happily inspired in its choice of colors, and most particularly in the principle it has laid down, of marking the sub-divisions of the Periods by gradual shades of the conventional color, of which the darkest represent the most ancient étages.

A special map in course of publication, has likewise adopted the International color scale, and confirms still more this favorable impression. I speak of the map of France in 48 pages, at the scale of 1 : 500,000^{e} of Messrs. VASSEUR and CARES, of which 13 sections have already appeared, and are shown in the cartographic collection at the Bergakademie [in Berlin]. The authors have succeeded in representing the Jurassic étages by seven graduated tints of blue, and the cretaceous étages by eight tints of green. Although so numerous, these shades are perfectly distinct on close view, while from a distance one obtains at a glance the Jurassic regions, the Cretaceous, etc. The result ought to encourage us to continue in the same path in deciding on the colors which remain to be determined.

I come now to the pending questions which it is necessary to decide now in order to permit the continuation and the completion of the work.

Of the ten resolutions proposed to the Congress of Bologna for the unification of graphic methods, the last two were substituted by the creation of the committee on the geological map of Europe; seven were adopted with or without modifications; a single one was sent back to the committee on the map in order that it should lay some propositions before the Congress of Berlin (No. III).

All that regards the colors assigned to the archæan terranes,

and to those of the secondary and tertiary eras, is determined upon in like manner as the use of notations, shades, hachures and various symbols. It only remains to determine the shades to be assigned to the systems of the primary era, and to the eruptive rocks, and in addition some questions of detail which are rather within the province of the commission.

For the *primary era*, or the *palæozo-era*, the report read at Bologna proposes the following colors:—

gray for the *Carbonic* (Permian included);
brown for the *Devonic;*
violet for the *Siluric* (Cambrian included).

The decision which intervened at Bologna to apply the color violet to the Trias, obliges us to modify the third term of this proposition. As to the two others, they were adopted by the Direction in its provisional table, and in the sheets colored by hand which have been submitted to you. In point of fact the Permian, the Coal Measures, and the Culm are there represented by three shades of gray, and the subdivisions of the Devonic by three shades of brown.

As to the *Siluric* the Direction has represented it in its attempt at coloration by tints of dark green. But is it not to be feared that the color will produce confusion with the green of the Cretaceous, of which the lower étages must necessarily be dark green? Is it not advisable to differentiate still further these two systems so wide apart in the scale? The committee will be obliged to study this point, but it is not ready to make you a definite proposition. It begs the Congress to adopt the colors proposed for the two higher periods, and to refer back to it the choice of a tint to be assigned to the *Siluric.*

As to the mode of representing eruptive rocks, the commission on unification did not make any proposition at Bologna.

On the other hand a proposition of the Swiss committee has met with pretty general acceptance at Foix and Zurich. This

proposition is to employ red colors, strong and intense, rather opaque, to designate the eruptive rocks, and to form of these latter five groups:

1. Old acidic eruptions.
2. " basic "
3. Recent acidic "
4. " basic "
5. Modern "

The direction of the map has declared itself satisfied with this mode of representation, but asks to be permitted to distinguish by special shades, on the one hand Euritic Porphyries, and on the other the Serpentines. This distinction really seeming useful to us, the Commission proposes to the Congress to adopt the seven divisions of the provisional table, which go from strong bright red to dark brownish red.

Some other questions of detail, but nevertheless of a general application, arose:

a) How are the terranes of a known system, but of which one cannot specify the subdivision to be represented on the map? From different quarters it has been proposed to employ the mean shade, with the letter without exponent; for example: *Jurassic undetermined*=medium blue with a *J*.

b) What is to be done if the subdivisions are perfectly determinable but the scale of the map does not permit them to be represented? The mean shade might be employed accompanied by the characteristic letter with several exponents; as, for example: *The entire Jurassic* in a narrow strip=medium blue with J^{1-3}.

c) How is a terrane of doubtful age to be represented, even so far as its system is concerned? The case will occur in the Alps and doubtless elsewhere. The Swiss committee proposed for this case the following method, viz.: to employ the color of the terrane which is the most probable, but with parts left without color, producing the effect of stippling. To the charac-

teristic letter one may add the sign of doubt; for example: *Jurassic* (*doubtful*)=blue dotted with bare places and *J*?.

d) Finally the representation of terranes of a known age, but of affinities in controversy, will present also some difficulty. This is the case for example with the *Gault*, which some wish to join to the Lower Cretaceous, and others to the upper cretaceous. It is equally the case with the *Rhœtic*, which some ascribe to the Trias and others to the Lias. On our map of small scale these terranes will only form a narrow border which will not even exist except in certain places. At the same time, by reason of the divergence of views with regard to these terranes, it is necessary to represent them in a very distinct manner, which will not pre-judge the question of their affinities, very probably varying in different countries. We proposed for that a very simple and practical means, which seems to find favor. The plan is to represent these terranes by a line of points in strong color, on the very boundary of the two colors in contact. Thus for example the *Rhœtic* would be represented by a line of red dots at the contact of the violet and dark blue. In this manner, neither of the two schools would be offended, and the question of affinity, or of association, would remain intact.

These four questions, all important as they are, belong more properly to the province of the Committee on the map, which begs the Congress to leave to it their solution.

Conclusion.

In order to facilitate the discussion and notation, I now resume the propositions which have been submitted to you by the Committee on the map.

A decision with regard to them by the Congress is indispensable in order that the direction may continue its important work, and carry it to a satisfactory conclusion with the assistance of the International Committee.

Resolutions.

I. M. DE MOELLER having resigned is replaced in the committee by Mr. KARPINSKI.

II. The *Carbonic* System, or Permo-carboniferous, will be represented by a gray color in three distinct shades.

III. Shades of brown will be assigned to the *Devonic* System.

IV. The color of the *Siluric* is left to the choice of the Committee on the map.

V. The eruptive rocks will be represented by seven tints, extending from strong bright red, to dark brown-red.

VI. The determination of the other questions mentioned in the Report is left to the discretion of the Committee on the map.

These are the six points, gentlemen, on which we ask your vote; and may the map on which we have labored be soon in the hands of all, and prove itself really useful for geological instruction, and for the clarification of our ideas.

In the name of the International Committee.

E. Renevier, Prof.

General Secretary.

International Geological Congress.

Commission

for the

Uniformity of the nomenclature.

Report of the secretary,

G. DEWALQUE.

The secretary of the commission has received reports only from the Committees of Germany, Belgium, Spain, France, Hungary, the British Isles, Roumania, Portugal, and Switzerland: and besides, many of these are extremely summary. The following report, therefore, is far from being able to be considered as presenting the résumé of the opinions professed by the geologists of the different countries of Europe represented in the commission.

G. D.

I. The Congress of Bologna had not the time to discuss all the conclusions of the report which we had the honor of presenting to it in the name of the committee for the uniformity of nomenclature, based on the reports received from the national committees. We believe it to be our duty to commence by recalling the decisions which have been arrived at; we put in parentheses the numbers they bore in our report of 1881.

Stratigraphic Divisions.

1. The word "formation" carries with it the idea of origin, and not of time. It ought not to be employed as a synonym of "system" or "étage." But one may say very well "*eruptive formations*," "*granitic formations*," *gneissic, calcareous . . . marine formations, lacustrine . . . chemical, detritic formations.* . . . (15).

2. The higher divisions comprising many terranes, following the French nomenclature, will be designated by the word *group*. For example, the secondary *group* (1).
3. The divisions of the second order now designated by the word *terrains* in French, will be called *systems* (2).
4. The divisions of the third order will take the name of *series* in French. This word will have for synonyms in other languages the words *section, series, Abtheilung* (3).
5. The divisions of the fourth order shall be designated by the word *étage*, or by the corresponding terms *piano* (Italian), *piso* (Spanish), *stage* (English), *Stufe* (German), etc. (2).
6. The divisions of the fifth order shall be designated in French by *assise* (5).

   N.B. The right of choosing in its own language the equivalent of the word *assise* was reserved to each nation.
7. The French expression *couches* (in the plural) may be employed as a synonym for *assises* (6).

   N.B. The Congress has not pronounced its opinion on the corresponding terms *beds* (English), *Schichten* (German), *strati* (Italian). . . .
8. The case may present itself where a geologist believes that he ought to group a certain number of assises in certain intermediary divisions which when united will form an étage. In such a case such beds will bear in French the name of *sous-étages* (7).
9. The first element of stratified terranes is the *strate* or the *couche*, *Schicht* (German), *stratum* (Latin, English), *estrato* or *capa* (Spanish), *strato* (Italian,

Roumanian), *estrato, camada* (Portuguese), *rétek* (Hungarian) . . . (8).

Chronological Divisions.

10. The word *era* is applied to three or four grand divisions of time corresponding to *groups* (18).
11. The duration of time corresponding to a system will be rendered by the word *period* (19).
12. The duration of time corresponding to a series will be expressed by the word *epoch* (20).
13. The duration of time corresponding to an étage will be expressed by the word *age* (21).

II. Such are the resolutions adopted at the Congress of Bologna. Before proceeding further it would seem that the Congress of Berlin ought to be appealed to first of all to complete Nos. 6 and 7, by determining the terms of foreign languages which correspond to the French words *assise* and *couches*. The reports received from the national committees do not permit of the formulation of a proposition.

III. In the second place, urgent protests have come from divers directions against the employment assigned to the words *group* and *series*. The Secretary of the Commission does not think that he is authorized to propose to change a point decided. The Congress of Berlin will have to decide this question which seems to belong here.

IV. We shall now reproduce the articles of the report of 1881, which could not be discussed at Bologna, while making some slight changes, instigated by the deliberations of Foix and Zurich, or by the reports of the national committees.

The word *banc, Bank, banco,* . . . is applied

to beds thicker or more coherent than those contiguous to it, or among which they are intercalated (9).

V. Conversely the thin or little coherent beds will be designated by the word *lit* (French), . . . (German), . . . (English), *lacho* (Spanish), *leito* (Portuguese) . . . (10).

VI. The English plural *rocks* and its corresponding *roches, roccie,* shall have the same signification as *assise* or *couches.* Examples: *Llandovery rocks, roccie a globigerine,* etc. . . . (11).

It is desirable to attribute to the *assise* an extended topographical signification; and to employ the synonyms *couches, roches,* to represent regional variations of an assise. (Proposition of the Portuguese Committee.)

VII. A *zone, zona,* . . . is a congeries of beds, of a lower order, characterized by one or more special fossils which serve to determine it.

This expression is then the synonym of the foregoing, from which it differs by the *necessary* adjunct of one or two names of fossils.

It may also be that a zone is an assise, although it is ordinarily a division of the fifth order (12).

VIII. The name of *horizon* is given to a bed or a number of beds which possess salient characters, enabling them to be recognized easily over great extents of territory. For example, the ferruginous *horizon* of the zone of *Ammonites opalinus* (13).

The word *niveau* can be taken in the same sense.

IX. The word *dépôt, deposit* (English), *deposito* (Italian, Spanish, Portuguese) . . . ought not to be applied except to a mass produced during a limited time or space, and characterized by a certain petrographical hemogeneity (14).

X. The names of the units of every order should be

univocal (of one word), and as much as possible of euphonious termination (22).

XI. It is desirable that the different orders of units be distinguished by particular homophonous terminations. Thus:

a) The Congress admits for the groups the termination *aire, är* (German), *ary* (English), *ario* (Spanish, Italian, Portuguese). . . .

b) Is it desirable to change the names of the *systems* generally admitted so as to render them homophonous, that is to say, having the same termination?

In the affirmative case, what shall be the termination of the systems?

According to the reports which have come to us, the negative appears more probable. If it be adopted, the following terminations are proposed:

c) It is desirable that the names of *series* should terminate uniformly in *ique* (French), *isch* (German), *ic* (English), *ico* (Spanish, Italian, Portuguese, Roumanian).

d) It is desirable that the names of étages terminate uniformly in *ien* (French), *ian* (German), (English), *iano* (Spanish, Italian, Portuguese, Roumanian).

e) It is desirable that the names of étages be borrowed from a geographical appellation, either Latin or existing. (Proposition of the Swiss committee.)

XII. The names taken from petrography, for instance, "grès bigarré, craie, calcaire grossier," are excluded from the nomenclature. Nevertheless, restricted to the local synonomy they can be retained where it shall be necessary (23).

XIII. A name of a place cannot serve for the formation of names of two units of different order, even under the system of homophonous terminations. For example,

the simultaneous employment of expressions such as *portlandic series* and *portlandian étage* would present serious inconveniences (24).

XIV. In how many groups or eras must the whole body of systems and the epochs which correspond to them be divided? (25) *

XV. The Congress accepts for these groups the denominations *primary, secondary* . . . (26).

XVI. The Congress accepts, as synonyms of the foregoing, the expressions *palæozoic, mesozoic.* . . .

XVII. The chronological equivalent of the term *assise* is *phase.* (Proposition of the Portuguese committee, in response to the 6th question of President Capellini for the conference of Foix.)

The execution of the geological map of Europe, decided upon at Bologna, has necessitated an attempt at classification of the Neptunian masses. The international committees assembled at Foix, called the attention of the national committees to this point. A circular of the President, Mr. Capellini, was addressed to them in order to hasten the answers relative to certain points concerning which it was urgent to come to a decision in view of the map. The following are the principal resolutions which were adopted at the meeting at Zurich in 1883.

a) A large majority voted in favor of the division of the Cretaceous system into three series; but, in case the scale of the map did not permit of but two divisions, the great majority is in favor of joining the Gault to the lower Cretaceous. Switzerland and France alone propose to place this étage in the Upper Cretaceous. It is understood that this decision is provisional, and does not prejudice the scientific solution.

The Assembly, in addition, expressed the hope that the line

* See below what is said on the subject of the Tertiary system.

which bounds the two divisions of the Cretaceous system, should be accentuated in those places where the Gault exists.

b) The word Flysch shall be eliminated from the legend of the map.

c) The question of the place to assign to the Rhætic series could not be decided. The direction of the map has been requested to essay its representation without making of it a new division, so that one can distinguish it from the Trias and the Lias by a special symbol (stippling, hachures. . . .).

The provisional legend contained 27 terms.

To the crystallophyllian formation are related the first three:

1. Gneiss and Protogine.

2. Crystalline schists (mica schists, talc schists and chlorite-schists, amphibolic schists and schistose gneiss).

3. Phyllites (argillaceous schists, *Urthonschiefer*). The conference decided unanimously on the union of these three terms into one system, which shall take the name of Archæan. Nothing was decided as to the redistribution of the rocks of this system into three series; but the committee of the map is advised to replace the word *phyllites*, which might lead to confusion. After these came:

4. Cambrian (lower than the Llandeilo).

5. Lower Silurian (2d fauna of Barrande).

6. Upper Silurian (fauna 3d F.).

The Conference was in favor of limiting the Cambrian to the beds of Llandeilo *and Arenig*, and of suppressing the indications of faunas 2d and 3d. It recommended the name of Ordovician for No. 5 and that of Silurian for No. 6. Finally it united these three terms* in a single system, of which the name will be chosen later.

The divisions 7, 8 and 9 are ascribed to the Devonian system.

Nos. 10 and 11 are proposed for the Carboniferous; 12 and

* In our opinion, it is in consequence of a typographical error that the *minutes of the meetings* of Zurich speak only of the union of Nos. 5 and 6.

13 for the Permian. This classification gave rise to a debate which was not decided by a vote. Several members insisted on the union of the four series into one system; it was also thought that it was unadvisible to divide the Permian.

Nos. 14, 15 and 16 are ascribed to the Trias; 17, 18 and 19 to the Jurassic system; 20 and 21 to the Cretaceous; 22 to 25 to the Tertiary; 26 to the Diluvium; 27 to the Alluvium.

It is then in this state that the question has come back to the national committees. Unfortunately, as we have already said, a large number of them have not sent any report; the greater part of the others have limited themselves to an examination of the best national classifications. The Secretary of the Commission, therefore, possesses but insufficient elements to elaborate a report of which the propositions can be submitted to the Congress as emanating from the majority of the commission. Nevertheless, as a basis is indispensable for an eventual discussion, he is about to pass in review the opinions expressed in favor of the divers systems.

A. Archæan System, Nos. 1, 2 and 3.—The first question to settle is that of knowing whether it ought to be included in the Palæozoic series. The negative does not seem to be doubtful. Consequently, and conformably to the proposition of the French Committee, we propose to the Congress to decide that the system shall form one group, called the *primitive group*. The termination of the word *primitive* will recall the characters which distinguish it from the groups *primary*, *secondary*, etc.

This group will comprise but one system, the *Archæan* system.

The name of the *Archæan system* is far from having obtained all the suffrages; thus, the English Committee* prefers the name *Pre-Cambrian*, the Belgian that of *Cristallophyllian*, the Hungarian Committee that of *Crystalline Schists*.

* This is apparently an error. See Prof. Hughes' remarks in the debate of the 2d day. P. F.

The English, Belgian, Spanish and Hungarian committees accept the division into three groups proposed in the suggested legend of the map. On the other hand, the French Committee comprehends in its *primitive series*, but two divisions, that will be specified later; the third division enters into the *Cambrian system;* Portugal and Roumania have the same views, but less radical. The first two divisions would constitute the *Crystallophyllic* (Portuguese Committee), or *Laurentian* (Roumanian Committee) *system.* The third division would become the *Archæic* or *Huronian system.*

B. Nos. 4, 5 and 6. The conference of Zurich has provisionally admitted the union into one system of the different beds corresponding to the Cambrian and Silurian of the British Isles, for which it remains to determine a name. The French, Portuguese and Roumanian committees propose the name of the *Silurian system.* Before voting on this proposition, the Congress will first have to express its views on the names to be given to the three groups and on their union into one or two systems. True, the Hungarian Committee proposes a *Cambrian* and a *Silurian* system, this latter comprising the groups 5 and 6 united; the Belgian Committee would have proposed an analogous association, if it had not preferred to conform to the decision rendered at Zurich by a large majority.

The French committee does not propose any name for the three groups. The Roumanian committee designates them by the inadmissible names (they must be univocal) of *lower, middle,* and *upper.* The Belgian committee proposes the terms; *Cambrian Ordovician,* and *Silurian;* the Portuguese substitutes for this latter the name *Bohemian.* We have already recalled that the English committee has not been summoned to pronounce upon the suggestions of a report which have been submitted to it.

Since the despatch of the reports of the national committees the question to determine has become complicated. Mr. Jules Marcou in an important work published by the American

Academy of Science and Arts, and entitled "*The Taconic system and its position in stratigraphic geology,*" has vindicated the priority of the term *Taconic*, of which the *Cambrian above-mentioned* (of primordial fauna) would be the equivalent. To us, the thing seems to be demonstrated. In this case the term *Cambrian* would be selected to replace the *Ordovician;* the name *Silurian* would come back by right to group 6. If we are not mistaken this solution would remove many difficulties.

We propose then to the Congress to determine, first, the name which the groups 4, 5, and 6 should bear.

It will afterwards have to decide whether they shall constitute one or two systems; afterwards the name or names to employ.

C. Devonian System, Nos. 7, 8 and 9.—a) Conformably to the only propositions which have been made, the Congress is asked to decide that the three series of this system shall bear respectively the names of *Réhnan*, *Eifelien*, and *Famennien.*

b) We propose to it to decide next that the Calceola beds ought to form part of the Eifelian series.

c) Finally we propose to the Congress to decide that the upper limit of the Devonian system is found at the base of the Carboniferous limestone; that is to say that the system comprises the psammites of the Condroz, the *lower carboniferous* (Kiltorkan, Marwood, Pilton), the upper Old Red or the calciferous sandstone (Dura-Den), etc.

D. Carboniferous System. Nos. 10 and 11.—a) It will have been observed that the conference of Zurich discussed at length the question of determining whether this system ought not to be joined to the succeeding. The Portuguese report is the only one which proposes the union. We propose to the Congress to decide first that the Carboniferous shall preserve its actual limits.

b) The conference of Zurich approved the proposed legend of the map, according to which the Carboniferous is divided into two series. The French report, basing itself on the results fur-

nished by fossil botany, proposes a division into three series, permitting one to distinguish the belt of coal measures of the north of France, of Belgium, and of Westphalia, from the greater number of the basins of central Europe. The Congress will have to pronounce its judgment on this point.

c) The lower division is essentially formed by the Carboniferous limestone, *Mountain limestone*, *Bergkalk* and the *Culm*. What is exactly its upper limit? The reports of the national committees do not express themselves at all on this point. We propose to the Congress to establish it at the base of the *Millstone grit*, conformably to the proposed legend presented by the Direction of the map.

c) On the hypothesis that the Congress maintains the division of this system into two series, we propose to call them *Bernician*, and Coal Measures.

E. Permian System, Nos. 12 and 13.—*a*) The Congress has, in the first place, to choose the name of the system; it is known that many geologists prefer the expression *Dyas*, or *Dyassic* system.

b) Is there any reason to divide this system into two series?

c) What is the boundary to be given to these series?

d) What names shall they bear?

d) Mr. Renevier, followed by Mr. Mayer-Eymar, proposes the names *Lodévian* and *Thuringian*.

F. Triassic System, Nos. 14, 15 and 16.—a) The division into three series proposed by the suggested legend, is generally accepted. The Congress will have to decide whether it prefers it to the division into two, proposed by the Hungarian and Portuguese committees.

b) What are the boundaries of the series adopted?

c) What shall be the names of these series?

The names *Pécilian*, *Conchylian* and *Keupric*, which have the priority, and *Vosgian*, *Wurtzbourgian* and *Carnian* have been proposed.

G. Jurassic System, Nos. 17, 18 and 19.—a) The division into three series is generally accepted:* what names shall be given to them?

The only expressions proposed (without counting *lower, middle* and *upper*) are *Lias, Dogger* and *Malm,* to which there are numerous objections. We will recall only that according to the admitted rules, these names ought to be adjectives to add to the word *series.* If one can say *liassic* series, can one cause *doggeric* or *malmic* to be accepted?

The second should be called *Bathonian* by taking the word in its primitive acceptation. I seek in vain a term for the third, for it comprises what Brogniart, I think, and d'Omalius divided into Oxfordian and Portlandian. Some proper geographical denomination will without doubt be found.

b) Ought the Rhætic (not including the Hettangian) to be joined to the Trias or the Lias?

Ought the Rhætic including the Hettangian to form the first series of the Jurassic system which would thus comprise four divisions? While admitting for the map three tints for the Triassic system and three for the Jurassic, cannot one represent the Rhætic by a special symbol? If so, must the word be taken in a strict or a broad sense?

c) According to the majority of opinions expressed, the

*We think we ought to reproduce here the first terms of the classification of the rough draft of a report presented to the English Committee: it admits also a division into three, but very different from the usual division.

- Jurassic
  - Oolites
    - Upper Oolites,
    - Middle Oolites,
    - Lower Oolites.
  - Lias
    - Upper,
    - Middle,
    - Lower.
  - Rhætic.

upper limit of the Liassic series lies at the base of the zone of *Ammonites Opalinus.*

d) According to the majority, the upper limit of the Bathonian series, or Dogger, lies at the base of the Callovian.

H. Cretaceous System, Nos. 20 and 21.—a) We have already alluded to the debates of the conference of Zurich on the division of this system. If one places himself at the point of view of the exigencies of the proposed map, it appears that the division into two series is imperative.

b) In this case the majority is of the opinion that the Gault should be joined to the Lower Cretaceous.

c) We recall the fact that the conference of Zurich expressed the wish that the line marking the boundary between the two series should be strengthened in those places where the Gault exists.

d) Similarly it has been asked whether it would not be possible without adopting an additional division or color, to represent by a special symbol (stippling, hachures, . . .) the Wealden in those places where it exists over considerable areas.

J. Tertiary System. We meet here a very grave question, which has not been treated of in the national reports. The scheme for a legend of the map does not even intimate any solution, but the votes of the Congress on paragraphs 14, 15 and 16 of the present report will have solved it without doubt when it shall have arrived at the point where we are.

The question is whether the *Tertiary* group is the last, or whether it is followed by a *Quaternary* group.

In both cases it is necessary to ask whether the group comprises one or more systems. A division is indispensable for the terminology.

The French report admits a Tertiary group, including the three systems *Eocene, Miocene,* and *Pliocene,* and a *Quaternary* group, comprising but one system not named, divided into two series, *Quaternary* and *Actual.* The English report, on the

contrary, admits but *one Tertiary group*, which it divides into *Eocene, Oligocene, Miocene, Pliocene, Pleistocene* and *Recent;* but it does not at all concern itself with the question of knowing whether these divisions ought to be considered as so many systems of the Tertiary group, or as series of one or more systems to be named. The Hungarian report admits the same classification* in slightly different terms: *Cenozoic* Group, divided into *Eocene, Oligocene, Miocene, Pliocene Diluvium* and *Allurium;* according to the disposition of the table these divisions would be systems. The Belgian Committee is nearly of the same opinion. It believes it to be useful to introduce a seventh division, *Paleocene*, into the classification, if not on the map; it makes of the whole a single group and a single system. Finally the Portuguese Committee admits but one group, *Tertiary* or *Cenozoic*, comprising two systems. The lower, *Hesocenic*, is divided into two series, *Paleogene* and *Neogene*, comprising respectively the étages *Eocenian* and *Oligocenian*, *Miocenian* and *Pliocenian*. The upper system, *Malacenic*, forms a single series, *Cenogene*, divided into two étages, *Pleistocenian* and *Holocenian*.

The question is sufficiently complicated to be discussed and determined very methodically. In the absence of better counsel, the following questions present themselves for discussion:

a) Shall the diverse strata comprised between the base of the Tertiary and the most recent beds, inclusive, constitute a single group, the *Tertiary?*

b) If so, is it desirable to establish more than one system in this group?

c) If so, what shall these systems be? What are the series to be established in each of them?

d) If not, what are the series to be established in this system?

It is understood that the establishment of a series compre-

* In order to appreciate the propositions of the Hungarian Committee the reader is requested to consult the report of the committee.

hends the question of its boundaries, and that of the name to be given to it.

It would be perhaps more practical to consider specially the necessities of the geological map of Europe and—relegating to the next Congress the discussion of the classification to adopt from a purely scientific point of view—to ask the Congress of Berlin, in the first place, if it is of the opinion that the six divisions proposed by the Direction should be represented on the map. It is extremely probable that the answer will be affirmative. This point disposed of provisionally, in one way or the other, the classification to adopt for this whole number can be discussed: one, two, or three systems: one or two series.

Plutonic Formations.

All that relates to the Plutonic formations has hardly been touched upon in the reports of the national committees for the Congress of Bologna. The report of the Committee for the Uniformity of Nomenclature also confined itself to presenting the following proposition, emanating from the Hungarian committee.

The massive crystalline rocks or Plutonic formations are divided into a) *granitic*, b) *porphyritic*, c) *trachytic*, d) *basaltic*, and e) *volcanic* (28).

The Congress of Bologna did not take up this question.

Then at the Conference at Foix in September, 1882, Mr. Vilanova called attention to this subject. Mr. Beyrich offered some observations, and appeared disposed to accept on behalf of the committee of the map, but always provisionally, the following five terms: *granitic, porphyritic, melaphyric, trachytic,* and *basaltic.*

The following year at the conference at Zurich, the discussion was resumed and new propositions arose. Thus, Mr. Vilanova proposed simply two series, an *acidic series*, and a *basic series.* The Swiss committee in a report which was published in the

Archives des sciences physiques et naturelles (t. IX, p. 432), proposed the grouping into *ancient eruptive rocks* and *recent eruptive rocks*, moreover it established in each of the two categories, a group of *acidic rocks* and a group of *basic rocks;* a fifth division comprised the actual lavas. Mr. Neumayr supported by Mr. Renevier, claimed a division for the serpentines. Mr. Beyrich accepted the principle adopted by the Swiss committee, finding the number of divisions, however, insufficient. He was in favor of adding a sixth for the serpentines, and a seventh for the great masses of porphyry, which could not be confounded with granite. It was decided that experiments based on the classification proposed by Mr. Beyrich should be made by the Direction of the map and submitted to the Congress of Berlin.

The reports of the Hungarian and Portuguese committees are the only ones which concern themselves with this question.

The Hungarian committee maintains its proposition. Taking into consideration the petrographic character and the chronological character, it proposes the following divisions: *granitic rocks*, *porphyritic rocks*, subdivided into porphyritic *biotitic* or acidic rocks, and porphyritic *augitic* or basic rocks, and into which the trachytes enter; finally, *peridotic rocks*, comprising the melaphyres, basalts, lavas, etc., as well as the serpentines.

The Portuguese report proposes the following division:

1st. Ancient acidic eruptions, ancient basic eruptions, recent acidic eruptions, recent basic eruptions, actual eruptions.

These documents are too few in number to be able to present a proposition to the Congress. We will call to mind, besides, that the Direction of the map has promised various experiments: it is probable that this will lead to a sketch of a legend, on which the discussion can be established.

Classification of Eruptive Rocks for the International geological map of Europe.

The provisional color-scale of the international geological map of Europe contains seven colors for the eruptive rocks, of which three are for the acidic, three for the basic, and one for the actual eruptions.

To the end of unification we propose to arrange the different rocks into seven groups, according to a classification established by Prof. Lossen that we shall follow for Germany. To wit:

1. *Color of Granites, Syenites &c.*

Granite. (*Granitite, Amphibolegranite, Protogine in part.*)

Syenite. (*Augite-syenite, Monzonite, Miascite, Ditroite, Foyaite.*)

Quartz-Diorite. (*Tonalite, Banatite, Quartz-Mica-Diorite.*)

Quartz-Norite. (*Diorite free from Quartz, in part.*)

2. *Color of Porphyries.*

Quartz-Porphyry. (*Felsite-Porphyry, Granite-Porphyry, Granophyre, Pyromeride, Microgranulite, Micropegmatite, Pyroxene-Quartz-Porphyry, Quartz-Keratophyre, Felsite-Pitchstone.*)

Porphyry free from Quartz. [*Syenite-Porphyry, Orthoclase-Porphyry (Orthophyre), Augite-Syenite-Porphyry (Rhomboidal Porphyry), Keratophyre.*]

Quartz-Porphyrite and Porphyrite in part, ultimately Quartz-Kersantite.

3. *Color of Trachytes, Phonolites, &c.*

Quartz-Trachyte. (*Rhyolite, Liparite with Obsidian, Pitchstone and Pearlstone.*)

Trachyte. (*Sanidine-Trachyte, Sanidine-Oligoclase-Trachyte, Trachyte-Obsidian.*)

Phonolite.

Quartz-Andesite (*Dacite*), *Quartz-Propylite, Propylite.*

Amphibole-Andesite, Mica (Biotite) Andesite, Augite-Andesite in part Bronzite-Andesite. (Hypersthene-Andesite.)

Dacite-Obsidian, Dacite-Pitchstone, Dacite-Pearlstone.

4. *Color of Melaphyres, &c.*

Diabase, Olivine-Diabase, Palæopicrite, Proterobase, Quartz-Diabase, Salite-Diabase, Leucophyre, Epidiorite, Augite-Porphyry, Labradorite-Porphyry. (Porfido verde antico.)

Ophite, Eucrite, Diabase.

Melaphyre, with or without Olivine, Augite-Porphyrite, Porphyrite in part, Bronzite-Porphyrite, Diabase-Porphyrite.

Eucrite-Melaphyre.

Mica-Diabase and Mica-Melaphyre, Lamprophyre.

Kersantite.

5. *Color of Serpentines.*

Serpentine (Ophiolite), Diallage-Serpentine, Bronzite-Serpentine, Gabbro (Euphotide), Olivine-Gabbro Saussurite-Gabbro, Zoltenfels, Norite (Hypersthene-Gabbro, Bronzite-Gabbro, Enstatite-Gabbro).

Labradorite-rock, Diallage-rock, Olivine-rock.

Diorite without Quartz in part, Corsite, Augite-Diorite, Gabbro-Diorite.

6. Color of Basalts, Dolerites, &c.

Dolerite, Anamesite, Feldspar-Basalt, Eucrite-Basalt (with or without Olivine, hence Augite-Andesite of Rosenbusch in part).

Nepheline-Dolerite (Nephelinite), Nepheline-Basalt.

Leucitophyre (Leucitite), Leucite-Basalt, Hauynophyre.

Tephrite, and Basanite, Buchonite, Limburgite, Magma-Basalt.

Melilite-Basalt.

Teschenite and Picrite.

7. Color of present eruptions.

The rocks of all the volcanic centres, which have only become extinct during the Quaternary

era, or which have been active in the historical epoch, or which are yet actually active.

Signed

Beyrich,

Hauchecorne.

Abstracts

of the

Reports of the National Committees.

BY THE SECRETARY OF THE AMERICAN DELEGATES.

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*The German Committee.

On behalf of the German Committee Prof. Zittel reports that besides sending out the printed circular containing the questions proposed by Prof. Capellini, a conference was held in Munich, at which von Gümbel, Haushofer, v. Ammon, G. Böhm, Schlosser, Rothpletz and Oebbeke were present.

Question 1 was decided in the affirmative.

Question 2. All votes but one favor joining the Rhaetic to the Trias. Q. 3. All favor the union of the Gault with the lower Cretaceous. Q. 4. A majority favors joining the Flysch to the Eocene. Q. 5. The colors chosen are unanimously approved. Q. 6 & 7. The Germans will abide by the decisions of the Congress. A majority favored using *Series* for the divisions of the 1st order, and "*Group*" for those of the 3d order.

The English Report.

The English Report, of which bare mention is made in the Report of the Committee on Nomenclature, occupies 147 pages, or allowing for difference of conciseness between French and English, about twice as much as the Reports of both the Committees of the Congress, all the National Reports included.

There is a very large amount of the most instructive matter in these pages, especially for the teacher, since the origin of the names of formations as well as tabular views of their parallelisms

* The reports follow each other in their alphabetical order in French.

are given with scrupulous fidelity. But the same reasons which probably prevented Professor Dewalque from appending this Report to his should all the more exclude it here, because no just condensation of it can be made, and it is too long to publish entire. A third reason, however, which may have deterred him would not have the same effect here, viz.: that it was not presented in the French language.

The plan on which it was undertaken and the pains with which the plan was carried out are alike admirable.

The Committee of Organization consisted of:

President.

Prof. Thomas McKenny Hughes, M.A., F.G.S.

Secretaries.

J. E. Marr, M.A., F.G.S.
Thomas Roberts, B.A., F.G.S.

Reporters.

H. B. Woodward, F.G.S. Tertiary, (Pliocene, Pleistocene, and Recent.)

Clement Reid, F.G.S.

J. Starkie Gardner, F.G.S., F.L.S. (Eocene, Oligocene, and Miocene.)

A. J. Jukes-Brown, M.A., F.G.S. Cretaceous.

Wm. Topley, F.G.S. Cretaceous.

W. Huddlestone, M.A., F.R.S., F.G.S., F.L.S. Jurassic. (a. The Oolites.)

J. F. Blake, M.A., F.G.S. Jurassic. (b. Lias, and Rhætic.)

A. Irving, B.A., B.Sc., F.G.S. Permian and Trias.

G. H. Morton, F.G.S. Carboniferous, Devonian, and Old Red.

A. Strahan, M.A., F.G.S. Carboniferous, Devonian, and Old Red.

J. E. Marr, M.A., F.G.S. Pre-Cambrian, Cambrian, and Silurian.

The most that can be done with this compact and valuable Report is to take out here and there a few tables and paragraphs in order to illustrate the character of the work.

UPPER TERTIARY.

The following general classification of the Pliocene, Pleistocene, and Recent, is adopted for the Tertiary as that according with the majority of opinions expressed:

- Tertiary
  - Recent
    - Historic
    - Iron
    - Bronze
    - Neolithic
    - → Pre-historic.
  - Pleistocene
    - Palæolithic
    - and Glacial.
  - Pliocene
    - Upper Crag.
      - Forest bed and Norwich Crag series.
      - Red Crag.
    - Lower Crag.
      - Coralline Crag.
      - Lenham Beds.

H. B. Woodward.

Reporter.

LOWER TERTIARY.

Mr. Gardner's Classification, *Geol. Mag.* 1882.	Classification if term Oligocene be not adopted.	Proposed Classification, if "Oligocene" be used.	Forbes. *Surv. Mem. I. of Wight*, 1856.	Lyell. *Student's El.* 1878.	Von Koenen. *Q. J. G. S.* 1863.	Judd. *Q. J. G. S.* 1880.
C. OLIGOC.	LOWER MIOCENE.	MIDDLE OLIGOCENE. Hempstead marine. Bembridge freshwater marls (including Hempstead do.) with a marine oyster band near base. Bembridge Limestone, freshwater. Osborne Marls, freshwater. Upper Headon, freshwater.	UPPER EOCENE. Hempstead marine. Hempstead Upper freshwater " Middle " " Lower " Bembridge Marls with oyster band. Bembridge Limestone. Osborne Marls, freshwater. Upper Headon, "	L. MIOCENE. Hempstead marine. Hempstead freshwater. [Bovey-Tracey beds.]	MIDDLE OLIGOCENE. Hempstead beds, &c.	MIDDLE OLIGOCENE. Hempstead series. "Bembridge group."
L. OLIGOCENE.	UPPER EOCENE.	LOWER OLIGOCENE. Middle Headon, marine (includes Brockenhurst bed) Lower Headon, freshwater.	Middle Headon, marine. Lower Headon, freshwater.	UPPER EOCENE. Bembridge fluvio-marine. Osborne or St Helens. Headon Series, marine and freshwater, including sands at base of Headon Hill. (H. Hill Sand.)	L. OLIGOCENE. Upper Headon. Middle Headon, including Brockenhurst bed. Lower Headon.	LOWER OLIGOCENE. ["Brockenhurst series."] "Headon-group."
UPPER EOCENE.	MIDDLE EOCENE.	UPPER EOCENE. Upper Bagshot Sands, of Hampshire estuarine. Barton Sands and Clays.	Upper Bagshot Sands. Barton Beds.	Barton Sands and Clays.	U. EOCENE. Upper Bagshot Sands. *l. c.* p. 99. Barton Clay.	U. EOCENE. Barton Clay.
MIDDLE EOCENE.		MIDDLE EOCENE. Middle Bagshot or Bracklesham. Lower Bagshot, including Hengistbury, Bournemouth, [or Bovey?] beds.	Bracklesham or Middle Bagshot. Lower Bagshot.	M. EOCENE. Bracklesham or Bagshot series, including Bournemouth beds.	M. EOCENE. Bracklesham series, &c.	
LOWER EOCENE.	LOWER EOCENE.	LOWER EOCENE. London Clay. Oldhaven beds. Woolwich, brackish. Thanet Sands, marine.	L. EOCENE. London Clay. Woolwich and Reading beds. Thanet Sands.	L. EOCENE. London Clay. Woolwich and Reading series. Thanet Sands.	L. EOCENE. London Clay, &c.	

Lyell says [*Student's Elements*, p. 239] that *Cerithium plicatum* occurs in Middle Headon. This is an error. Hence no argument can be drawn from it "as objection to the line proposed to be drawn between Miocene and Eocene." E. B. TAWNEY.

E. B. Tawney adds a note on the term Oligocene in substance as follows: It was proposed by Beyrich in 1855 (4?) for the lowest North German Tertiaries. But these are only passed through by certain mine shafts, and their relations to the beds below cannot be observed. The English sections of the Hampshire basin show perfectly well the relations of the Lower Oligocene to the beds above and below, hence the English area is where the Lower Oligocene question can be best worked out. This report concludes by endorsing the claims of mollusca to the title of the readiest aids to a comparison between beds in different areas. It reminds us, however, that deeper and littoral mollusca of dissimilar characters exist contemporaneously. The evidence must be taken with caution. The classification by terrestrial remains, though not yet thoroughly studied, will doubtless some day enable the observer through the plant-remains to define horizons "as unmistakable and well defined as any with which we are now acquainted."

CRETACEOUS SYSTEM.

The Reporters of the Cretaceous System think it stands in great need of revision and emendation. The names for the several divisions are of various kinds, some being trivial and local, and the form of the name gives no indication of the rank of the division; i. e. Gault, Chalk, Marl, Greensand; and Ashdown Sands, Shanklin Sands, Hythe Beds. The Reporters suggest the following classification of the whole Cretaceous system:

- Cretaceous System.
  - Upper
    - Chalk.
      - Danian.
      - Senonian=Up. Chalk.
      - Turonian=Md. Chalk.
      - Cenomanian = Lower Chalk.
    - Greensands.
      - Gault and Up. Greensand.
      - Vectian = L. Greensand.
  - Lower
    - Purbeck-Wealden Series.
      - Weald Clay.
      - Hastings Sands.
      - Purbeck.

JURASSIC.

The opening sentence of the report is as follows: "*On the application of the term* JURASSIC. This word being of foreign origin is not to be met with in the works of any of the earlier English geologists."

The following is regarded as a generalized division of the Oolitic Rocks of England from above downward:

		Probable Foreign Equivalents.
Upper Oolites.	7. Purbeck.	Purbeckien.
	6. Portland Sand and Stone.	Portlandien (pars).
	5. Kimeridge Clay.	Portlandien (pars) and Kimeridgien.
Middle Oolites.	4. Corallian.	Corallien and Oxfordien superieur.
	3. Oxford Clay with Kellaways rock at base.	Oxfordien inferieur and Callovien.
Lower Oolites.	2. Great Oolite.	Bathonien.
	1. Inferior Oolite.	Bajocien.
	a. Supra-Liassic Sands.	Aalenien.

INFERIOR OOLITE.

DIVISIONS.	TOPOGRAPHICAL VARIETIES.	LITHOLOGY, &c.	SOME OF THE CHARACTERISTIC FOSSILS.
I. SCARBORO' or GREY LIMESTONE. 3-60 ft. ZONE 3.	1. Coast type. Thins rapidly on the dip towards the S.E., tolerably constant towards the interior along the outcrops. 2. Howardian type.	1. Blue and grey impure Limestones, shales, mudstones and ironstones, rarely oolitic. Roadstone, rough masonry (Scarboro' Pier). 2. Siliceous "pot-lid" Limestones.	1. *Bel. giganteus*, Schlot. *Am. Humphresianus*, Sow. *Am. Blagdeni*, Sow. *Avicula Braamburiensis*, *Phil.* *Pteroperna plana*, M. and L. *Trig. costata* (var. *denticulata*, Ag.) *Trig. signata*, Ag. Brachiopoda mostly absent. *Am.* "*læviusculus*" occurs at Hundale.
i. Middle Estuarine Series. 50-100 feet.		Sandstones and Shales, contains the main seams of moorland coal.	Dwarfed marine fossils sporadically. The "plant bed" is very rich in vegetable remains.
J. MILLEPORE SERIES. 10-40 ft. on the coast. ZONE 2.	1. Coast type. Thickens towards the S.E., variable in composition. 2. Howardian type, Whitwell Oolite, and Brandsby Beds in part.	1. At Sycarham a ferruginous grit, and sometimes a gritty irony lime rock with "Kaolinite." 2. Fawn-colored sandy Limestone and Oolite, lower beds blue-centred.	1. *Gervillia lata*, Phil. *Trig. recticosta*, Lyc. *Trig. conjungens*, Phil. *Ceromya Bajociana*, D'Orb. *Pygaster semisulcatus* Phil. *Gonioseris angulata*, Dunc 2. *Cardium Buckmani*, M. and L. *Isocardia cordata*, Buckm. *T. recticosta* and *conjungens*, *Pyg. semisulcatus*, and *stom. germinans*, Phil. *Ter. submaxillata*, Dav.
j. Lower Estuarine Series. ?-300 ft.	Attains its maximum in Staintondale Cliffs.	Sandstones, often massive, and Shales. Building stones in Eskdale.	Traces of a marine horizon with *Pholadomya*, etc., Numerous plant remains.
K. DOGGER. 4-80 ft. on the coast. ZONE 1.	The "top seam" of the miners. The Rosedale magnetic ore belongs to the lower division.	Arenaceous ironstone, in parts oolitic, resting on yellow and grey micaceous sands at Blue Wyke Point.	*Gervillia tortuosa*, Phil. G. *lata*, Phil. *Macrodon Hirsonensis*, D'Arch. *Trig. denticulata*, Ag. *Trig. v-costata*, Lyc., small var. *Trig. spinulosa*, Y. and B. *Cardium acutangulum*, Phil. *Astarte elegans*, Sow. *Ceromya Bajociana*, D'Orb. *Rhynch. subobsoleta*, Dav. In the sands *Am. aalensis*, Ziet. *Am. comensis*, Von Buch. (*teste* Wright, *Q. J. G. S.* vol. xvi. p. 4). *Lingula Beanii*, Phil. *Discina reflexa*, Sow. *Rhynch. cynocephala*, Rich. *Ter. trilineata*, Y. and B.
JURENSIS BEDS.			

The following is the Oxfordian section in Yorkshire, according to Hudleston, including the *Lower Calcareous Grit*, which may be regarded as Upper Oxfordian, or as the base of the Corallian, according to fancy.

Divisions.	Topographical Varieties.	Lithology.	Some of the Characteristic Fossils.
E. Lower Calcareous Grit. 80-100 ft.	Similar varieties occur in all the districts. Thickens towards the interior. Zone 7 occurs in this series.	1. Hard blue calcareous grits—quarried for road metal —alternating with 2. Yellowish calcareous sand-rock, often full of small cavities — building stone.	*Bel. abbreviatus*, Mill. *Am. perarmatus*, Sow. *Am. cordatus* and *vertebralis*, Sow. *Am. convolutus*, Quens. *Am. canaliculatus*, Münst. *Gryphæa dilatata* and *Pinna lanceolata*, Sow. *Modiola bipartita*, Sow. *Astropecten reclus*, M'Coy. *Rhynch. Thurmanni*, Voltz.
F. "Oxford Clay." 120-150 ft. on the coast.	Similar varieties occur in all the districts. Thins towards the interior. About 70ft. in the Howardian Hills. Zone 6 occurs at the base.	Grey sandy shales and clays, becoming bluer and less sandy below.	Upper — *Am. perarmatus*, rarely. Middle—Small Ammonites, young of *A. Eugenii*, Rasp., *A. crenatus*, Brug., etc. Lower—*Bel. Owenii*, Pratt. *Am. Lamberti*, Sow. *Am. athleta*, Phil. *Am. oculatus*, Phil. *Am. crenatus*, Brug. Varieties of *A. cordatus* throughout.
G. "Kellaways Rock." 5-80 ft.	Zone 5 occurs at the top. Thins on the dip towards the S. E., but rather increases along the outcrop towards the W. Scarcely traceable in the Howardian Hills.	The fossil beds, though only a few feet thick, are varied in their lithology. Reddish-yellow or chocolate grits with spathose shells and large oval blue-grey and very sandy Calcareous Grits. Brownish-yellow sandstones in the mass, quarried for building at Hackness.	*Bel. Owenii*, var. *tornatilis*, Phil. *Am. Jason*, Rein. *Am. Duncani*, Sow., and var. *gemmatus*, Phil.—the *ornati*. *Am. athleta*, Phil. *Am. hecticus*, and *lunula*, Rein. *Am. Chamusseti*, D'Orb. *Am. Gowerianus*, Sow. *Am. Kœnigi*, Sow. *Am. modiolaris*, Luid. *Am. macrocephalus*, Schlot. var. *rugosus*, Leck. *Gryphæa*, var. of *dilatata*, Sow. *Trig. paucicosta*, Lyc. *Anatina undulata*, Sow. *Wald. umbonella*, Lam. (near to *ornithocephala*, Sow.).

The division between the Brown and White Jura of the Continent occurs it is believed in the unfossiliferous sandy clays between zones 6 and 7.

MIDDLE OOLITES—*Corallian.*

The *Corallian Rocks* of England were the subject of a tolerably exhaustive memoir by Blake and Hudleston (*Q. J. G. S.* for 1877). Under this title were included all the rock masses between the Oxford and Kimeridge Clays. It should be observed that in parts of central England the entire series is absent, or only represented by contemporaneous clays such as the *Ampthill Clay.* In such areas the entire Jurassic column above the Cornbrash is argillaceous with a few thin stony bands here and there.

Blake and Hudleston traced the *Corallian Rocks* from Weymouth on the Channel to Scarborough on the shores of the North Sea, and published a table of comparative sections indicating the various developments of these masses at 14 different stations.

The volume of these rocks is much greater towards the extremes than in the central area, varying from 230 ft. at Weymouth to 98 ft. at Oxford, whilst in Yorkshire the average is between 200 and 300 ft.

1. Calcareous Grits and Clays, moderately fossiliferous on certain lines, characterize the lower division, which is usually known as the *Lower Calcareous Grit. Am. perarmatus* is characteristic.

2. The central division is more complex, but is usually calcareous with much shelly oolite towards the lower part, and at many of the stations is surmounted by Coral Limestones, all very fossiliferous. In general terms these represent the *Coralline Oolite* and *Coral Rag. Am. plicatilis.*

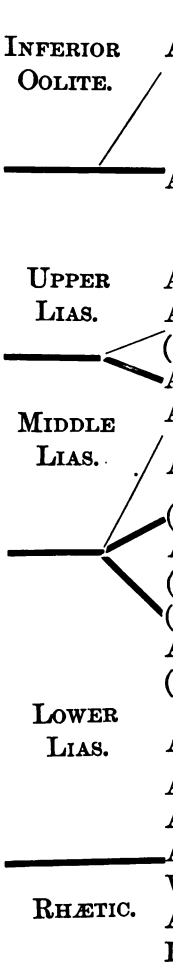
3. The upper division is very unequally developed, and in some of the central areas is entirely absent. In the south this upper division is characterized by marls, claps and grits, which are often ferruginous, and sometimes by pisolitic iron ores of considerable economic value. In Yorkshire the hydraulic limestones and clays of this upper division are sometimes succeeded by reddish cherty grits. This upper division is usually known as the *Upper Calcareous Grit,* but as this petrological title is so misleading in most cases, Hudleston proposed the term *Supracoralline Beds.* Mr. H. B. Woodward would retain the term *Upper Calcareous Grit* for these beds.

Annexed is a table showing the *Corallian* column in Yorkshire (Hudleston, *Yorkshire Oolites,* pt. III.) excluding the *Lower Calcareous Grit* (E) already estimated under Oxfordian. B. and C. constitute the *Upper Limestones* of the Geological Survey.

CORALLIAN COLUMN (MIDDLE OOLITE).

Divisions.	Topographical Varieties.	Lithology—Remarks.	Some of the Characteristic Fossils.
A. Supracoralline. 15-40 ft. wanting in places.	1. Upper Calcareous Grit flanking the western part of the Vale of Pickering. 2. Argillo-calcareous beds (Throstler) of the same locality. 3. Argillo-calcareous beds (Cement stones) of the Howardian Hills.	Reddish Calc. Grits, often cherty, with sometimes marly shales. Dirty earthy Limestones, very unfossiliferous. Hard calcareous bands and soft subcalcareous Shales.	*Belemnites nitidus*, Dollf. *Am. varicostatus*, Buckl. *A. alternans*, Von Buch. *Ostrea bullata*, Sow. *Gryphæa subgibbosa*, Bl. & H. *Pecten Midas*, d'Orb. *Modiola cancellata*, Rœm. *Lucina aspera*, Buvig. *L. substriata*, Rœm. *Thracia depressa*, Phil. *Goniomya*, *Pleuromya*, &c.
B. Coral Rag, sub-zone of *Cidaris florigemma*. 12-40 ft.	1. Rag of the Scarborough district without *Cidaris florigemma*. 2. *Florigemma*-Rag flanking the western part of the Vale of Pickering on both sides. 3. *Florigemma*-Rag of Langton Wold.	Boulders of *Thamnastræa concinna*, and branches of *Rhabdophyllia* in an intercoralline brash. Variety of Corals: often massive, sometimes compact and cherty, rarely oolitic. Compact Limestones; massive Coral Bands, shelly brash, rarely oolitic.	*Zone of A. plicatilis.* *Am. varicostatus* (Buckl.) var. of *A. plicatilis*. *Purpuroidea nodulata*, Y. & B. *Natica globosa*, Rœm. *Cerithium limæforme*, Rœm. *Nerinæa Rœmeri*, Goldf. *Littorina muricata*, Sow. *Turbo funiculatus*, Phil. *Ostræa duriuscula*, Phil. *Pecten vimineus*, Sow. *Lima pectiniformis*, Schlot. *Arca quadrisulcata*, Sow. *Astarte rhomboidalis*, Phil. *Opis virdunensis*, Buvig. *Terebratula insignis*, Schuebl. *Cidaris Smithii*, Wr. *C. florigemma*, Phil. *Hemicidaris intermedia*, Flem. *Pseudodiadema hemisphæricum*, Ag.—Coral Rag. *Belemnites abbreviatus*, Mill. *A. plicatilis*, Sow. *A. cordatus*, Sow. *Chemnitzia heddingtonensis*, Sow. *Nerinæa visurgis*, auct. *Cerithium muricatum*, Sow. *Pecten intertextus*, Rœm. *Cucullæa corallina*, Damon. *Trigonia Meriani*, Ag. *T. perlata*, Ag. *Lucina aliena*, Phil. *Astarte Duboisiana*, d'Orb. *Pygurus Hausmanni*, K. & D.—Coralline Oolite. N. B.—The top shell-bed of the Lower Limestones is included with the Coralline Oolite palæontologically.
Ct. Middle Calcareous Grit. 10-45 ft.	The *Trigonia*-beds at the top of this series in the Pickering district are referred palæontologically to the Coralline Oolite.	An Arenaceous Calc. Grit, sometimes with Shell-beds, where it graduates into the overlying series. Building.	
D. Lower Limestones. 20-120 ft. N. B.—The above figures do not represent the absolute *maxima* and *minima* of each formation.	*Upper Division.* 1. Oolites underlying the M. C. G. of the Tabular Hills. 2. Oolites, sometimes split by a fourth grit, of the Hambleton Hills. 3. Oolites of the Howardian Hills in part. *Lower Division.* 1. Passage-Beds at base of the Lower Oolite in the eastern districts. 2. Cherty Limestones of the Western districts. 3. Basement Limestones above the L. C. G. of the Howardian Hills.	Small-grained Oolites, frequently rather gritty, much used for lime. Gritty small-grained Oolites, often very impure, quarried for lime and roadstone. Thick-bedded Oolites, formerly much burnt for lime. Coarse gritty Limestones, often ferruginous. The basement beds not well distinguished here. Fig-seedy Limestones, with much grit—building, road stones.	*Upper part of Zone of A. perarmatus.* *Belemnites abbreviatus*, Mill. *A. perarmatus*, Sow. *A. cordatus*, Sow. (*excavatus*). *A. goliathus*, d'Orb. *Cylindrites elongatus*, Phil. *Avicula ovalis*, Phil. *A. expansa*, Phil. *Pecten fibrosus*, Sow. *Gervillia aviculoides*, Sow. *Myacites*. *Pholadomya*. *Echinobrissus scutatus*, Lam. *Holectypus*. *Ammonites Williamsoni*, Phil. *A. goliathus*, d'Orb. *Avicula ovalis*, Phil., and *expansa*, Phil. *Gervillia aviculoides*, Sow. *Trigonia clavellata?* Sow. *T. triquetra* Von Seeb. *T. spinifera*, d'Orb. *Bowerbya triangularis*, Phil. *Waldheimia bucculenta*, Sow. *W. Hudlestoni*, Walk. *Terebratula Aleyensis*, Walk. *Rhynch. Thurmanni*, Voltz. *Glyphea rostrata*, Phil. *Millericrinus echinatus*. Goldf. *Spongia floriceps*, Phil.
E. Lower Calcareous Grit proper.			

The following table may be said to express the general views on the Classification of the Lias.



	Zones.	
Inferior Oolite.	A. opalinus	= Midford Sands and Cephalopod bed of Dorset and perhaps of Gloucestershire.
	A. Jurensis	= Clays of Yorkshire and possibly Sands of Gloucestershire.
Upper Lias.	A. bifrons	= Alum Shale.
	A. serpentinus	= Jet Rock.
	(A. annulatus)	= Grey Shale.
	A. spinatus	= Ironstone } = Marlstone.
	A. margaritatus	
Middle Lias.	A. { capricornus or Henleyi	
	(A. ibex)	
	A. Jamesoni	
	(A. armatus)	
	(A. raricostatus)	} = Belemnite beds.
	A. oxynotus	
	(A. obtusus)	
Lower Lias.	A. { semicostatus or Turneri	
	A. Bucklandi	
	A. angulatus	
	A. planorbis	
	White Lias	
Rhætic.	Avicula contorta	includes Bone bed.
	Lower Marls	

COMPARATIVE TABLE SHOWING THE VIEWS EXPRESSED ON THE DYAS AND TRIAS.

		Mr. Aveline.	Mr. Brodie.	Mr. Davies.	Mr. De Rance.	Mr. Hudleston.	Prof. Hull.	Prof. Rupert Jones.	Mr. Strahan.	Mr. Teall.	Mr. Ussher.	Mr. Wilson.	Prof. Hughes.
JURASSIC		...	...	...	...	...	...	...	...	...	... (Passage—series of red marls in S.W. of England)	...	Passage into Jurassic
TRIAS	Keuper	break										break	
	V	...	...	...	...	...	...	...	...	...	...	...	Only unimportant local variations and interruptions in the continuity of sedimentation, such as that between the Bunter and Keuper, or that between the Dyas and Trias, or that at the base of the Upper Magnesian Limestone in places.
	Bunter	break (considerable)	break (in Warwickshire)		break (in Lancashire)		break (general)	break		(break insignificant)		break (not very marked)	
DYAS	Dolomitic Series	...	...	...	...	...	...	...	...	...	...	...	
	Sandstone and Conglomerates (Rothliegendes)	break										(Wanting in N.E. of England)	Great unconformity
		...	...	...	...	...	...	...	...	...	...	...	
CARBONIFEROUS		break (very marked)				break (very marked)				break		break	

NOTE. In the above Table only views actually expressed have been noted. The absence of any note is not to be understood that the existence of a break at any horizon (e. g. between Bunter and Keuper) is denied.

Carboniferous.

COMPARATIVE TABLE OF THE TYPES OF CARBONIFEROUS ROCKS BY PROF. G. A. LEBOUR, M.A., F.G.S.

A			B				C
Kulm Type.	Belgian Type.	Irish Type.	Culm Type.	Anthraxiferous Type.	Bernician Type.	Scottish Type.	Central France Type.
Land and fresh-water (Coal Measures)	Land and fresh water with sometimes a few marine horizons (Coal Measures)	Land and fresh-water with a few marine horizons (Coal Measures)	? Culm Series of Devon	? Land and fresh water shale and slate Series	Land and fresh-water (Coal Measures)	Land and fresh-water (Coal Measures)	? Land and fresh-water (Coal Measures)
Shore deposits chiefly (Flœtzleerer Sandstein)	Ampelites (marine and shore deposits (Millstone Grit)	Marine beds and shore deposits (Lower Coal Measures and Millstone Grit)			Land and fresh water with marine horizons & shore deposits Gannister Beds & Millstone Grit	Land and fresh-water (Millstone Grit ?)	
Unconformity Great slaty Series with Posidonomya Becheri (Upper Kulm Slates)	Great calcareous marine series (Mountain Limestone [including so-called Yoredale Rocks and Lower Carboniferous Shale])	Great calcareous marine series (Carboniferous Limestone [including so-called Yoredale Rocks and Lower Carboniferous Shale])			Land and fresh-water with numerous marine calcareous horizons (Bernician Series [including so-called Yoredale Rocks])	Land and fresh-water with fewer marine calcareous horizons (Carboniferous Limestone Series [including so-called Lower Coal Measures of Scotland])	? Unconformity
	Sandstone Deposit (Condroz Beds)	Yellow Sandstone with Anodonta Jukesii			Land and fresh-water with a few marine horizons and unfossiliferous Limestones and Conglomerates (Tuedian)	Calciferous Sandstone Series with marine bands among land and fresh-water deposits	
Gradual passage to	Gradual passage to	Gradual passage to	Gradual passage to		Passage to		
Devonian	Devonian	Devonian	Devonian	Devonian ?	Basement Beds	Upper Old Red Sandstone.	

N.B. Broken lines denote that there is no exact division possible.

No. 3. DIVISIONS OF THE CARBONIFEROUS SYSTEM[1].

DIVISIONS.	STAGES.	ENGLAND AND WALES.	IRELAND.	SCOTLAND.	FOREIGN.
Upper	G.	Upper Coal-measures of Manchester[2] &c., Ackworth Rock, &c.[3]	(Absent.)	Red Sandstones of Bothwell, &c.	
	F.	Middle Coal-measures with thick coal-seams.	Middle Coal-measures of Tyrone and Leinster.	"Flat Coal-Series" or "Upper Coal-Series."	Main Coal-Series of Belgium, France, &c. (Terrain houiller).
Middle	E.	Gannister Beds[4], or Lower Coal-measures, with Marine Fossils.	Lower Coal-measures of Drumglas (Co. Tyrone[5]) and of Kilkenny, &c.	"Slaty black-band" Ironstone Series[6].	Schistes de Lens, Auchy-au-Bois (Barrois). Schistes de Chokier (M. de Koninck). Silesia (Roemer).
	D.	Millstone Grit Series.	Millstone Grit (Co. Fermanagh), Flagstone Series (Carlow).	"Moorstone Rock" (or Roslin Sandstone).	Flötz-leererSandstein.
	C.	Yoredale Series[7].	"Yoredale Beds" Co. Fermanagh "Shale Series"[8] Carlow, &c.	Upper Limestone Series resting on "Lower Coal and Ironstone Series."	
Lower	B.	Carboniferous Limestone or "Mountain Limestone." Scaur Limestone (Sedgwick).	Upper Limestone[9]. Middle Limestone or Calp Beds[10]. Lower Limestone[11].	Lower Limestone Series.	Calcaire Carbonifère.
	A.	"Tuedian Group" (Tate), Lower Limestone Shale, &c.[12] Barnstaple and Pilton Beds (Hall,[13] and Marwood Beds of Devonshire.	Lower Carboniferous Slate (Cork) and Lower Carboniferous Sandstone "Coomhola Grits" (Jukes).	Calciferous Sandstone Series in two groups.	Schistes.

[1] This classification has been proposed in my paper (on the Upper Limit of the essentially Marine Beds, &c.) in the *Quart. Journ. Geol. Soc.* Nov. 1877. [2] Binney, *Trans. Geol. Soc. Manch* Vol. I. [3] Phillips, *Man. Geology*, 182 (1855). [4] *Ibid.* 182. [5] Hardman, "Geol. Tyrone Coal-field," *Mem. Geol. Survey*, Sheet—35. [6] Hull, *Quart. Journ. Geol. Soc.* Nov. 1877, P. 635. [7] Phillips, *Geol. of Yorkshire.* [8] Geol. Survey, Ireland. [9] [10] [11] Griffiths, "Geol. Map of Ireland," 1855. [12] [13] Geol. Survey, England. These beds by their position and fossils are clearly representative of the "Coomhola Grits" and Carboniferous Slate of the South of Ireland. Scuit. *Trans. Roy. Dub. Soc.* Vol. I. (New Ser.) p. 145.

No. 2. CLASSIFICATIONS OF THE SUBDIVISIONS OF THE DEVONIAN SYSTEM.

	T. Hall, Woodward and W. A. E. Ussher.		E. Hull.	Etheridge (*Q. J. G. S.* xxxvii. page 196).
Pilton Beds (J. Phillips)=Trilobite Schists	... ...		Lower Carboniferous Series	Lower Carboniferous Series
Baggy Beds (Etheridge)=Marwood Beds=Cucullæa zone (Hall) ...	... ...			
Upcot Flagstones (Hull)=Drayton and Slade Beds...	Upper Devonian	E_2	Old Red Sandstone or Upper Devonian ...	Upper Devonian
Pickwell Down Sandstone (Etheridge)=Woolacombe Sandstone (D. Williams)	... ...	E_1		
Morte Slates (D. Williams)=Morthoe Slates=Grey Slates (Etheridge)	... ...		... ...	Middle Devonian
Ilfracombe Beds (J. Phillips)=Calcareous Slates (Etheridge)=Combe Martin Limestone	Middle Devonian		D Middle Devonian	
Hangman Grits (Etheridge)=Martinhoe Beds (J. Phillips)=Trentishoe Beds (D. Williams)	... ...	C	Lower Devonian ...	
Lynton Slates (D. Williams)	Lower Devonian	B		Lower Devonian
Foreland Grits (D. Williams)=Lynton Sandstones (Etheridge)=Dunkerry Sandstone=Countesbury Sandstone (Godwin-Austen) ...		A_2	Passage Beds or Devono-Silurian ...	
Ludlow Beds	Silurian	A_1		Silurian

No 4. DIVISIONS OF THE OLD RED SANDSTONE AND DEVONIAN SYSTEM[14].

DIVISIONS.	STAGES.	DEVONSHIRE.	HEREFORDSHIRE AND SOUTH WALES, &c.	IRELAND.	SCOTLAND.	FOREIGN.
Old Red Sandstone or Upper Devonian.	E_2	Upcot Flagstones.	Red or Yellow Sandstone and Conglomerate.	"Kiltorcan Beds" (with *Anodonta Jukesii*).	Upper Old Red Sandstone of Dura Den, &c.	Psammite du Condroz.
	E_1	Pickwell Down Sandstone.		Upper Old Red Sandstone and Conglomerate.		Schistes de Famenne. Calcaire de Frasne
Middle Devonian.	D.	Morthoe Slates. Ilfracombe Limestone Series.				
Lower Devonian.	C.	Hangman Grits [Martinhoe beds (Hall)].	Sandstones, Marls with "Cornstones" (Estuarine Devonian)[15].	Absent in Ireland[16]. (*Great Hiatus.*)	Absent in Scotland. (*Great Hiatus.*)	Red Sandstones and Marls.
	B.	Lynton Slates and Limestones.				"Calcaire de Givet" and "Eifel Limestone" groups[17].
Passage Beds or Devono-Silurian[20].	A_2	Foreland Grits (upper part only visible). Passage Beds.	Probable representatives of the "Downton Sandstones" or rocks of the Ridge of the Trichrug.	Dingle or Glengariff Grits and Slates.	"Lower Old Red Sandstone."	Spirifer Sandstein[18], Poudingue de Burnot, "Aeltere Grauwacke"[19].
	A_1	Ludlow Beds.	Ludlow Beds.	"Ludlow Beds" of Dingle Promontory.		(Absent in France and Belgium.)

[14] This classification is in accordance with the views contained in my paper "On the Geological Relations of the Rocks of the South of Ireland to those of North Devon, &c." *Quart. Journ. Geol. Soc.* May, 1880. [15] Professor Ramsay and Mr. Goodwin-Austen regard these beds as lacustrine (*Phys. Geol. Great Britain*, 5 Ed. p. 105). In the paper above cited I have advanced reasons for considering the Hereford and Monmouth Beds to have been of estuarine origin physically connected with those of N. Devon which were being deposited contemporaneously in the open sea. The presence of the sea-waters is proved by the occurrence of *Lingulæ* in the lower beds near Bedw Llwyd in Brecon—and of Serpulæ in the upper beds at Caldy Island. [16] Murchison *Siluria*, 4 Ed. p. 281. Hull, *supra cit.* p. 264 and *Trans. Roy. Dub. Soc.* Vol. I. [17] [18] [19] Murchison, *supra cit.* 404, &c. [20] I suggest this as a convenient term by which to designate the group of strata lying on the borders of the Devonian and Silurian Systems in England and Wales, Ireland, Scotland and Europe.

PreCambrian, Cambrian and Silurian.

The reporter (M. Marr), remarks of the classification of the Cambrian and Silurian Rocks of the Geological Survey (of Great Britain and Ireland) that it is now very widely recognized, it is more accepted than any other and should be retained.

The classification is:

Lingula Flags Llandeilo Caradoc or Bala Lower Llandovery	Lower Silurian.
Upper Llandovery May Hill Sandstone Wenlock Ludlow	Upper Silurian.

Dr. Callaway gives

a) *Cambrian*
1. Harlech
2. Menevian
3. Lingula Flags
4. Tremadoc

b) *Ordovician*
1. Arenig
2. Llandeilo
3. Caradoc
4. Llandovery

c) *Silurian*
1. May Hill Sandstone
2. Wenlock
3. Ludlow

He adds that he accepts Lapworth's proposal to separate the 'Lower Silurian' as a separate system. The fauna justifies this, and the 'Silurian' of Murchison and the Survey is of disproportionate dimensions.

Palæozoic.

IRISH ROCKS (G. H. KINAHAN).

Mr. G. H. Kinahan proposes the following classification for the Irish Palæozoic Rocks.

	Suggested names.	
Coal Measures Limestones and Carbonif. Slate Yellow Sandstones (Griffiths)	Carboniferous.	Carboniferous.
Lower Old Red Sandstone (Jukes) Glengariff grits or Dingle beds (Jukes)	Passage beds.	Silurio-Carboniferous.
Upper Silurian.	Silurian.	Silurian.
Passage beds. (none.)	Passage beds.	Ordovicio-Silurian.
Lower or Cambro-Silurian.	Cambro-Silurian.	Ordovician (Lapworth).
Arenig group.	Passage beds.	Cambro-Ordovician.
Upper Cambrian. Lower Cambrian.	Cambrian.	Cambrian.

Prof. Sedgwick's classification of the Cambrian System is as follows:

- Cambrian
  - Upper
    - Upper Bala
    - Middle Bala
    - Lower Bala
  - Arenig or Skiddaw
  - Middle
    - Tremadoc
    - Ffestiniog
  - Menevian
  - Lower
    - Harlech
    - Longmynd, Bangor &c.
    - Llanberis

"Whatever classification may be adopted, so much confusion has arisen from the use of different nomenclatures, that any one wishing to study the Cambrian and Silurian rocks of Britain will unfortunately be compelled to pay attention to the classifications which have been adopted by various writers. It may be well therefore to annex a table containing the principal variations from the classifications originally proposed by the founders of the Cambrian and Silurian systems."

<table>
<tr><th>Sedgwick.</th><th>Geological Survey</th><th>Murchison.</th><th>Lyell and Hicks.</th><th>Lapworth.</th></tr>
<tr><td>Silurian.</td><td>Upper Silurian.</td><td>Upper Silurian[1].</td><td>Upper Silurian.</td><td>Silurian.</td></tr>
<tr><td>[2]Upper Cambrian.</td><td rowspan="2">Lower Silurian.</td><td>Lower Silurian.</td><td>Lower Silurian.</td><td>Ordovician.</td></tr>
<tr><td>[3]Middle Cambrian.</td><td>Primordial Silurian.</td><td rowspan="2">Cambrian.</td><td rowspan="2">Cambrian.</td></tr>
<tr><td>Lower Cambrian.</td><td>Cambrian.</td><td>Cambrian.</td></tr>
</table>

THE ARCHÆAN (PRECAMBRIAN) ROCKS.

The Reporter thinks that the Archæan rocks of the British Isles cannot be satisfactorily classified in the present state of the knowledge concerning them. He quotes the opinions of Mr. Aveline, Dr. Callaway, Dr. Hicks, Mr. Huddlestone, Prof. Bonney, &c., and part of the well-known discussion in the London Geological Society on the presentation of Dr. A. Geikie's paper "On the supposed Precambrian rocks of St. David's."

No classification is attempted.

The Belgian Committee.

The first three numbers of the table proposed at Zurich should constitute the "*Crystallophyllian.*" * * The fossil beds, classed by many authors as Huronian should become part of the Cambrian. * Accepting, not without opposition, the union of Cambrian and Silurian proposed at Zurich, there should be three divisions,—*Cambrian, Ordovician* and *Silurian.* The upper limit of the Cambrian should lie at the base of the "*Arenig*" of the British Isles. The Devonian should have three series, viz.: the *Rhénan, Eifelian* and *Famennian;* the Carboniferous two, viz.: the *Bernician,* and the *Coal Measures.* The boundary would pass at the base of the Millstone Grit or its equivalents. The Triassic should be divided into *Pécilian* (comprising the sandstone of the Vosges); the *Conchylian* and the *Keupric.* The Belgian Committee joins the *Rhœtic* to the *Lias,* but would represent this division simply by a symbol as far as possible. It would exclude the Hettangian of *Ammonites planorbis* and *A.*

angulatus. It places the upper limit of the Lias below the beds of *Ammonites opalinus* which forms the base of the Middle Jurassic. It objects to "*Dogger*" and "*Malm*" as not desirable words for moulding into Latin tongues. It adopts the threefold division of the Cretaceous. The lower in Belgium comprises only *the Hautrage sands and clays* (improperly called *Aachenian* by some French geologists): the middle series comprising the Gault and Cénomanian; the rest forms the upper divisions. The Tertiary comprises in one system the *Paleocene, Eocene, Oligocene* (from the Belgian *Tongrien* to the *Boldérien*), *Miocene* (for the '*Anversien*,' sands of *Panapœa Menardi* and sands of *Pectunculus pilosus*), *Pliocene* and *Post Pliocene*. This last comprising two étages, *Pleistocene* (*Quaternary* properly so-called), and *Modern*.

As to designating by "*Series*" the divisions of the first order and by "*Group*" those of the third order it has no preference, but would fear to establish a bad precedent.

[This report is unsigned in the printed re-production by Prof. Dewalque.]

The Spanish Committee.

Q. 1. The Spanish Committee proposes '*Archæic*' for the beds without fossils. Q. 2. It would make the *Rhætic* the base of the *Lias*. Q. 3. It would unite the *Gault* with the *Lower Cretaceous*. Q. 4. It would divide the *Flysch* into two parts, joining the Fucoid beds with *Helmintoidea Labarintica*, and *Palæotherium* to the *Nummulitic*; and the upper étage which comprises the schists and marls of *Natica crassissima* to the *Oligocene*. Q. 5. It would leave the choice of colors to the Direction of the map. Q. 6. It proposes '*Period*' as the chronological equivalent of "*Assise*." (*Tramo*.)

It proposes the following scheme:

	Chronological Divisions.		Stratigraphical Div's.		Homophonic Terminations.			
	French.	Spanish	Spanish.	French.	Span	Fren	Engl	Ger
1st Order.	Temps	Tiempos	Serie	Série	ario	aire	ary	är
2d "	Ere	Era	Terreno	Terrain	ico	ique	ic	isch
3d "	Age	Edad	Grupo	Groupe	eño	—	—	—
4th "	Epoque	Epoca	Piso	Etage	ano	ien	ian	ian
5th "	Période	Periodo	Tramo	Assise	ense	—	—	—

Q. 7. It favors interchanging the words *Group* and *Series;* designating by *series* the divisions of the first order and by *group* those of the 3d.

(Unsigned.)

The French Committee.

Over the signature of Prof. de Lapparent, its President, the committee urges strongly the selection of pelagic fauna as the basis of division into systems, and for distinguishing formations of continental origin by special symbols. It regards the proposed maps as an essay destined to serve as an object of fruitful discussion. In the descriptions of the different systems it proposes to divide the *Permian* into two étages, the lower being very closely related by its flora to the *Carboniferous.* The opinions being divided as to whether the *Gault* should be connected with the *Upper* or *Lower Cretaceous,* the Committee proposes to unite the *Gault* and the *Cénomanian* in an intermediate étage. It extends the Eocene to the upper limit of the Parisian Gypsum. It favors the division of the deposits of the glacial epoch and those of the present time into separate étages. [NOTE.—With the exception of the Portuguese, this report is the longest one appended by Prof. Dewalque. It abounds in interesting material, which, owing to lack of space, cannot be repeated here.—P. F.]

FINAL LEGEND ADOPTED BY THE FRENCH COMMITTEE.

	I. Primitive Series.	I a. Fundamental Granitoid Gneiss.	Dark rose.
		I b. Schistose Gneiss and Mica Schists; Amphibolic gneiss; Cipolin; Chloritoschists.	Pale rose.
Primary Series.	II. *Cambrian System.*	II a. (former III). More or less crystalline schists with rolled fragments of pre-existing rocks (part of the *pre-Cambrian* of the English and of the *Phyllites* of the Germans).	Reddish gray.
		II b. (former IV a). Cambrian, (Primordial Fauna).	Dark brownish red.
	III. *Silurian System.*	III a. Second Fauna.	Medium brownish red.
		III b. Third Fauna.	Pale brownish red.
	IV. *Devonian System.*	IV a. Lower Devonian.	Dark brownish rose.
		IV b. Middle Devonian.	Medium brownish rose.
		IV c. Upper Devonian.	Light brownish rose.
	V. *Carboniferous System.*	V a. Lower Coal Measures (Carboniferous limestone and Culm, Millstone Grit).	Blue gray.
		V b. Middle Coal M. (North of France, Belgium).	Gray.
		V c. Upper Coal M. (Central Plateau, Alps, Palatinate).	Pale gray.
	VI. *Permian System.*	VI a. Schists (Autun), and sandstone of *Callipteris* and *Walchia*.	Burnt sienna.
		VI b. Sandstone of *Ullmannia* and *Zechstein*.	Sepia.

FINAL LEGEND ADOPTED BY THE FRENCH COMMITTEE.—*Continued.*

Secondary Series.	VII. *Triassic System.*	VII a.	Lower Triassic (incl. Vosgian sandstone).	Dark violet.
		VII b.	Middle Triassic.	Medium violet.
		VII c.	Upper Triassic.	Bright violet.
	VIII. *Jurassic System.*	VIII a.	Rhætic (incl. Hettangian), and Lias.	Dark blue.
		VIII b.	Lower Oolite.	Medium blue.
		VIII c.	Upper Oolite (incl. Callovian).	Bright blue.
	IX. *Cretaceous System.*	IX a.	Lower Cretaceous.	Dark green.
		IX b.	Middle Cretaceous (Gault and Cénomanian).	Medium green.
		IX c.	Upper Cretaceous.	Bright green.
Tertiary Series.	X. *Eocene System.*		(Including Flysch.)	Dark yellow.
	XI. *Miocene System.*		(From the commencement of the Tongrian to the top of the beds of Hipparion of [Mount] Léberon.)	Medium yellow.
	XII. *Pliocene System.*		.....	Pale yellow.
	XIII. Quaternary Series.	XIII a.	Quaternary.	Naples yellow.
		XIII b.	Actual.	White.

A. DE LAPPARENT,
President of Section.

The Hungarian Committee.

LEGEND ADOPTED BY THE HUNGARIAN COMMITTEE.

A. STRATIFIED SEDIMENTARY ROCKS.

Cenozoic Group.	I. *Alluvium.*	(Separate.)
	II. *Diluvium.*	Quaternary. Loess. Comprising in its base also the fluviatile deposits of sands and gravels of *Elephas meridionalis.*
	III. *Pliocene.*	(Upper Neogene.) Comprising the *Levantine* and *Pontian* étages, to wit: the *Paludina* and *Congeria* beds.
	IV. *Miocene.*	(Lower Neogene.) Containing the *Sarmatian* and *Mediterranean* étages.
	V. *Oligocene.*	Comprising as its upper étage the *Aquitanian*, and as its lower étage the *Ligurian*, the gypsum of Montmartre.
	VI. *Eocene.*	The *Bartonian* étage, to which the beds of *Priabona* correspond, as Southern Alpine facies.
Mesozoic Group.	VII. *Cretaceous.*	VII a. Upper Cretaceous.
		VII b. Lower Cr. Comprising the *Gault* and at its base the *Barremian* étage.
	VIII. *Jurassic.*	VIII a. *Malm.* Comprising the lower *Tithonian* (Stramberg beds), and at its base the *Callovian.*
		VIII b. *Dogger.* Above, the Claus beds; below, the zone of *Ammonites opalinus.*
		VIII c. *Lias.* Comprising at its base the zone of *Ammonites planorbis* and *Ammonites angulatus.*
	IX. *Rhætic.*	The upper limit extends to the base of the zone of *Ammonites angulatus* and *planorbis*, while the lower limit excludes the *Hauptdolomit.*
	X. *Triassic.*	X a. *Upper.* The upper part is formed by the *Hauptdolomit*, the base comprising the horizon of *Trachyceras Reitzi.*
		X b. *Lower.* Muschelkalk and Buntsandstein.

LEGEND ADOPTED BY THE HUNGARIAN COMMITTEE.—*Continued.*

Palæozoic Group.	XI. *Permian.*	XI a. *Upper.*	(*Ullmannia* sandstone.)
		XI b. *Lower.*	(Rothliegendes with *Walchia piniformis.*)
	XII. *Carboniferous.*	XII a. *Upper.*	Productive measures.
		XII b. *Lower.*	Culm.
	XIII. *Devonian.*		In Hungary, only a trace of middle Devonian is known with certainty: viz.: in its southeast portion, in a Comitat (Vas) bordering on Styria.
	XIV. *Silurian.* XV. *Cambrian.*		Unknown in Hungary.

B. CRYSTALLINE ROCKS.

XVI. *Crystalline Schists.*	XVI a.	Various Phyllites. (Slates, Chloritoschists, Amphibolic, Graphytic, etc., schists, of which the age is unknown.)
	XVI b.	Mica Schists. Gneiss.
	XVI c.	Gneiss. Granite.
XVII. *Massive Crystalline rocks.*	XVII a.	Granitic Rocks. (Granite, Syenite, etc).
	XVII b.	Porphyritic Biotitic rocks. Cenozoic, (Trachytes); Older, (Porphyries).
	XVII c.	Porphyritic Augitic rocks. Cenozoic, (Augite-Trachyte); Older, (Diabase, etc.).
	XVII d.	Peridotic rocks. Cenozoic, (Basalts); etc.; Older, (Melaphyres, etc.).

Regarding the Serpentines the report says, "as the Serpentines are for the most part derived from peridotic rocks, they will be placed here and will have the same color; only the letter will serve to distinguish them."

BUDAPEST, June, 1884. DR. J. SZABÓ, *President of the Hungarian Committee.*

The Portuguese Committee.

Before entering upon the subject the Committee protests against the following words used in the Report of the Proceedings at Foix " * * as the map of Europe (will be the authority) for geological symbolization and nomenclature." The Committee regards the map as simply "an attempt at application," &c. It urges that it would be very unfortunate if the reverse were true; for a map on such a small scale cannot even serve as a model for the general map of a single country, still less for those on a large scale.

"Before the meeting at Zurich we had answered a circular of M. Capellini of March 21, 1883, which contained two questions of nomenclature which were not touched upon at that meeting. We repeat here the questions and our answers: "*Please propose a term as the chronological equivalent of 'assise' for the purpose of designating from this point of view the divisions of the 5th order.*" The word *age* having been admitted as the equivalent of *étage*, there only remains to us the word *phase* which we had proposed in 1880 for the divisions of the 4th order.

Seventh question: "*Are you in favor of interchanging the two terms* group *and* series *as has been proposed at Foix: designating by* series *the divisions of the first order, and by* groups *those of the 3rd order?*

The answer is affirmative."

The stratigraphic divisions and their chronological equivalents would be

	FRENCH.	PORTUGUESE.
1.	Seriés.—Ere.	Serie.—Era.
2.	Systéme.—Periode.	Systema.—Periodo.
3.	Groupe.—Epoque.	Grupo.—Época.
4.	Étage.—Age.	Andar.—Idade.
5.	Assize or Couches.—Phase.	Assentada or Camadas.—Phase.

Legend proposed by the Portuguese Sub-Committee for the geological map of Europe.

A.—Sedimentary Formations.

Series.	Systems.	Groups.	Étages.	Letters.
Tertiary (Cenozoic.)	Malacenic.	Cenogene.....	Holocenian.	
			Pleistocenian.....	Q
	Hessocenic.	Neogene.....	Pliocenian.....	P
			Miocenian.....	M
		Paleogene.....	Oligocenian.....	O
			Eocenian.....	E
Secondary (Mesozoic.)	Cretacic.	Upper Cretacic.	.....	C^2
		Lower Cretacic.	.....	C^1
	Jurassic.	Malm.	From Purbeckian to Oxfordian.	J^3
		Dogger.	From Callovian to bed...	J^2
		Lias.	From bed....to Sinemurian.	J^1
		Rhætic.	Hettangian included.	R
	Triassic.	Upper Trias.	.....	T^2
		Lower Trias.	.....	T^1
Primary (Palæozoic.)	Permo-Carbonic.	Permian.	.....	H^3
		Coal Measures.	.....	H^2
		Anthraciferous.	.....	H^1
	Devonic.	Famennian.	.....	D^3
		Eifelian.	.....	D^2
		Rhenan.	.....	D^1
	Siluric.	Bohemian.	.....	S^3
		Ordovician.	.....	S^2
		Cambrian.	.....	S^1
	Archæic.	Huronian (?)	.....	A
Primitive (Azoic.)	Crystallo-phyllic.	Laurentian (?)	.....	Cr.

Metamorphism undergone by any rock.....

B.—Eruptive Formations.

	LETTER.
Ancient Acidic Eruptions: Granite, Syenite, Euritic Porphyry, etc.....	γ
Ancient Basic Eruptions: Diorite, Melaphyre, Trap, etc.....	δ
Recent Acidic Eruptions: Trachytes, Phonolites, etc.....	
Recent Basic Eruptions: Basalt, Dolerite, Amphigenite, etc.....	β
Actual Eruptions.....	λ

N. B. Stippling, for volcanic aggregates of every category.

The Committee favors the projects relating to the *Nomenclator Paleontologicus*, the *International Review of Geology*, and the *Geological Dictionary*, but thinks that the former should not be commenced before some result follows the decision of the Bologna Congress, requesting an understanding with the zoological and botanical societies.

Signed, *Joaquim Filippe Nery Delgado.*
Paul Choffat.

With the approbation of

M. M. Alfredo Ben-Saude,
Adjunct of the Section of Geological Works.
Antonio José Gonçalves Gurinarães,
Professor at the University of Coïmbre.
Wenceslau de Lima.
Professor at the Polytechnic Academy of Porto.

The Roumanian Committee.

The report favors the acceptation of the following elements of stratification in the order of their importance. Banc, Couche, Lit. It objects to the paragraph II. 6, of Prof. Dewalque's report relative to *rocks, roches, roccie,* having the same signification as *assise,* and says that the first three words refer to the nature of the mass and not to its stratigraphical position, by the first resolution of the Bologna Congress.

TABLE OF CLASSIFICATION OF THE EARTH'S CRUST.

Groups.	Systems.	Series.	Étages.
Quaternary.	.....	.....	Lössian.
			Diluvian.
Tertiary.	Pliocenic.	.....	Upper.
			Lower.
	Miocenic.	.....	Upper.
			Middle.
			Lower.
	Eocenic.	.....	Upper.
			Middle.
			Lower.
Secondary.	Cretacic.	Upper Cretacic.	Danian.
			Senonian.
			Turonian.
			Cenomanian.
		Lower Cretacic.	Albian.
			Neocomian.
			Wealdian.
	Jurassic.	Upper Jurassic.	Portlandian.
			Corallian.
			Oxfordian.
		Lower Jurassic.	Bathonian.
			Bajocian.
			Liasian (including the *Infralias*).
	Triassic.	.....	Karnian or Keuper (Mojsisovics).
			Wurtzbourgian or Muschelkalk (Mojsisovics).
			Vosgian (Mayer-Eymar).
Primary.	Permic.	.....	Upper.
			Lower.
	Carbonic.	.....	Upper.
			Lower.
	Devonic.	.....	Upper.
			Middle.
			Lower.
	Siluric.	.....	Upper.
			Middle.
			Lower (including the Cambrian).
Primitive.	Archæic.	.....	Huronian.
			Laurentian.

(Question 1) The Roumanian Committee favors the union of Silurian and Cambrian; (Q. 2) the Rhætic to the Lias (under the name *Infralias*); and (Q. 3) the *Gault* to the Lower Cretaceous. (Q. 4) It also inclines to favor the union of the *Flysch* to the Eocene. (Q. 6) It moderately supports the chronological expression *phase* to be applied to beds (assises), although, "not exactly the right word." (Q. 7) It prefers to retain the word *Group* for divisions of the first order.

Signed, GR. STEFANESCU, *President.*

The Swiss Committee.

The committee of the Swiss Geological Society, in its séance of April 15, 1884, at Berne, decided unanimously (1), to accept the names of étages of the school of A. d'Orbigny, i. e., the termination in *ien* (in Italian *iano*, German *ian*). (2) It unanimously suggests that the names of étages be borrowed from some Latin or actual geographical appellation. (3) It recommends by six votes (M. M. A. Favre, de Fellenberg, Gilliéron, Heim, Jaccard, and Renevier); against two (M. M. Mayer-Eymar, and Mühlberg) that exceptions be made in favor of the names of étages in *ian* already in use and which have priority, such as Diluvian, Corallian, Conchylian, Pécilian, etc. The minority wished to make no exception to the rules.

Zurich, May 5, 1884.

CHARLES MAYER-EYMAR, *Professor.*

The above comprises digests of all the National Committee Reports.

An interesting communication from Prof. Renevier to the Societé Vaudoise des Sciences Naturelles, and published in its Bulletin, Vol. XXII, No. 94, has just been received. It contains some interesting information not to be found in the Reports of the Congress, part of which here follows:

* * * * * * *

c) Monograms.

This question being left to the Commission on the Maps, the latter recognized the duty of conforming to the decisions reached at Bologna of employing the *Latin initials* for the *sedimentary terranes*, and the *Greek initials* for the *Eruptive Rocks;* but on account of the smallness of the scale it decided to place everywhere lower case initials, which take up less room.

q for the *Quaternary* or *Diluvian;* m_4, m_3, m_2, m_1, for the divisions of the *Tertiary* ('t' being reserved for the *Trias*). c_2, c_1, for the divisions of the *Cretacic;* i_3, i_2, i_1, for the three divisions of the *Jurassic;* p. for the *Permian* that it has not yet been decided to join to the *Carbonic;* h_2, h_1, for the other divisions of the *Carbonic* ('h' for houille, 'c' designating the *Cretacic*); d_3, d_2, d_1, for the three divisions of the *Devonic;* s_2, s_1, for the two divisions of the *Siluric;* cb for the *Cambrian* which it has not yet been decided to join to the *Siluric.*

a^3, a^2, a^1, is to stand for the *Archæan.*

(In this case the exponent will be written above, to avoid the signification of a chronological order, and to designate simply three kinds of rocks.)

The following are the monograms selected for the *Eruptive Rocks,* and their arrangement, as proposed by the Direction in an autographed circular.

$\gamma =$ Granites (Ancient acidic eruptions of granular texture), to wit: Granite, Syenite, Quartz-Diorite, Quartz-Norite, &c.

$\pi =$ Porphyries (Ancient acidic eruptions of porphyritic texture), to wit: Quartziferous and Euritic Porphyries, Felsite-Porphyry, Granite-Porphyry, Pyromeride, Microgranulite, Micropegmatite, Retinite (Felsite-Pitchstone), Syenite-Porphyry, &c.

μ_1 = Melaphyres (Ancient basic eruptions), to wit: Melaphyres, Augite-Porphyry, Labradorite-Porphyry, (Verde Antique), Diabase, Ophite, Kersantite, etc.

σ = Serpentines, Euphotides, Gabbros, Norite, Hypersthenite, Corsite, Diorite without Quartz.

τ = Trachytes (Recent acidic eruptions), to wit: Trachyte, Rhyolite, Liparite, Andesite, Phonolite, Dacite, Obsidian, Perlite, Pitchstone, &c.

β = Basalts (Recent basic eruptions), to wit: Basalts, Dolerites, Anamesites, Nephelinite, Amphygenite, (Leucitophyre), Tephrite, Basanite. Limburgite, Teschenite, Picrite, &c.

ν = Lavas of modern volcanoes, extinct or active.

ν' = Tufas and agregates of the aforesaid modern volcanoes.

N. B. In each category the Agregates and Tufas can be designated by the letter *primed*, united to a stippling or hachure of the color adopted i. e.

β' = Basaltic Agregates.

The following Legend closes and resumes what concerns the geological map of Europe according to the diverse decisions above mentioned; account being taken of the deliberations which followed the report of Mr. Dewalque.

A. Sedimentary Terranes.

Systems	Subdivisions	Mongr.	Color	Tint
	Present deposits (alluv. &c.)		Cream	Very pale
	Quaternary (Diluvium)	q	Yellow	Naples
Tertiary	Pliocene	m_4	Yellow	Pale
	Miocene	m_3		Bright
	Oligocene	m_2		Dark
	Eocene	m_1		Orange
Cretacic	Upper Cretacic	c_3	Green	Pale
	Gault			Dotted boundary
	Lower Cretacic (Neocomian)	c_1		Dark
	Wealdian			With hachure
Jurassic	Malm	j_3	Blue	Pale
	Dogger	j_2		Bright
	Lias	j_1		Dark
Triassic	Rhætic		. . . . .	Dotted boundary
	Upper Trias (Keuper)	t_3	Violet	Pale
	Middle Trias (Muschelkalk)	t_2		Bright
	Lower Trias (Variegated Sandstone)	t_1		Dark
Carbonic	Zechstein	p	Gray	With hachure Brownish
	Permian			
	Coal Measures	h_2		Pale
	Lower Carbonic (Culm)	h_1		Dark
Devonic	Famennian	d_3	Brown	Pale
	Eifelian	d_2		Medium
	Rhenan	d_1		Dark
Siluric	Upper Siluric	s_2	Greenish Gray	Pale
	Lower Siluric	s_1		Bright
	Cambrian	c b		Dark
Archæan	Azoic Schists (Phyllites)	a_3	Rose	Pale
	Crystalline Schists	a_2		Bright
	Gneiss &c.	a_1		Dark

B. Eruptive Rocks.

Granites &c.	γ	Red	Carmine
Porphyries &c.	π		Purple
Melaphyres &c.	μ		Indian
Serpentines &c.	σ		Bistre
Trachytes &c.	τ		Vermilion
Trachytic Agregates	τ'		Ditto stippled
Basalts &c.	β		Venetian
Balsaltic Agregates	β'		Ditto stippled
Modern lavas	ν		Saturn
Tuffs and Modern Agregates	ν'		Ditto stippled

Prof. Renevier makes the pertinent suggestion that the scale of colors once established the latter may be applied as well to the collections of fossils as to the maps. Thus the Jurassic fossils should have blue labels or be in blue boxes (or both), etc. He points out an advantage of such a plan in palæontological collections which are arranged in zoological or botanical order, and in which necessarily chronological order is neglected.

Note 1.

This work has already been commenced by Prof. Hitchcock, who has placed it in the hands of Mr. Bien of New York, but owing to a projected voyage, Prof. H. will be unable to revise it for publication. He and Mr. McGee of the U. S. Geological Survey have requested the writer to do this, and it is hoped that the appearance of the map will not be long delayed.

P. F.

Note 2.

The following letter from Major J. W. Powell, was received after the pamphlet had been made up. It will best explain his position towards the Congress.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY.

WASHINGTON, D. C., March 26th, 1886.

DR. PERSIFOR FRAZER,
Philadelphia, Pa.

DEAR SIR:

* * * * * * * * * * * *

There is one point which seems to me to be of great importance, not only as a member of the American Committee, but also as a practical student of geologic cartography.

It seems to me desirable to strongly emphasize in publications designed for the information of American geologists, the fact that the taxonomic and color schemes of the proposed map of Europe do not represent a comprehensive and universally applicable system designed for general adoption in the various countries in which geologic investigation is now in progress, but are intended only for the specific purpose of enabling European geologists to agree upon a method of representing European phenomena in the most general terms upon a special map now in process of construction; and it does not even appear that it will be used by the several surveys now established in European countries. In methods of geologic cartography European geologists are now much in the

condition that the official geologists of this country were in past decades, when each official or amateur cartographer devised his own method of representing the structure of the particular territory upon which he was engaged; and it is useless to attempt to secure international conformity to European methods until (1) the different European nations shall have themselves come to substantial agreement in classification and in the use of cartographic conventions, and (2) all nations shall be fairly represented—i. e., shall have a numerical representation consistent with the importance of geologic development in each country—in the International Congress. Indeed, the geologic map of Europe when completed will constitute nothing more than a precedent—an important precedent it is true, but not more important than many others established in this country, in Europe, and elsewhere; and in so far as one of the prime objects of the Congress is concerned—i. e., the general unification of conventions required in geology—it has thus far accomplished practically nothing.

It would appear to be incumbent, too, upon the American Committee to point out to the geologists of this country that, however applicable the system of the geologic map of Europe may be to the representation of European phenomena, it does not necessarily follow that it will meet the requirements of the surveys of this country. There are two classes of map users—(1) the small class comprising the trained geologists of the various civilized countries, to whom it is desirable that geologic conventions and systems of geologic classification shall be uniform; (2) the vastly more numerous class who consult the maps by reason of their practical utility in the arts, and to whom unity of convention and classification is immaterial; and official geologists are compelled to remember that the value of the maps to the second class of users is a primary, and their convenience for the former class only a secondary consideration. In order that geologic maps may be of maximum value to the second class of users, it is essential that local rock varieties shall be clearly distinguished, and that minor distinctions in the rocks shall be strongly accentuated. Now, it is manifest that however closely the European and American rock sections may agree in general features, and however consistent the classification based upon palæontology may be in the two countries, the local variations in structure and composition of the one country are not reproduced in the other. Even if it were intended, therefore, that the classification and colors of the European map should form a basis for cartography in other countries, it would not serve the purpose of the official American geologist, whose methods are necessarily such as to meet the requirements of the American people.

Finally, as a member of the committee, it appears to devolve upon me to point out that the general system of cartography represented by the European map is in my judgment, and in that of at least the greater number of my official collaborators, incompetent. Perhaps I can best express my feeling in this matter by a quotation from the communication presented in my name before the International Congress at Berlin.

"It will be observed that in its fundamental principles this system (that in use by the United States Geological Survey) is the antithesis of that in common use (and represented by the European map). With the evolution of geologic science there grew up a system of symbolic and sometimes denominative conventions for the representation of geologic phenomena, in which the conventions are designed to suggest the characters and relations of the phenomena.

It implies a classification of the phenomena in which each element is properly correlated with each other element, and in which the sum of recognized elements forms a complete and symmetric whole; in view of the manner in which scientific classification is effected, it involves conference among geologists concerning obscure and doubtful points, in order that a consensus of opinion may be secured; and it requires modification of classification and consequent repetition of conference with each important geologic discovery. Though natural and simple in its inception, the fully developed system is highly artificial and cumbrous. In the system here advocated the conventions, both symbolic and denominative, are purely arbitrary. No classification save a semi-arbitrary allocation of the grander divisions of the geologic column is necessarily implied in the system, but any classification may be adopted without affecting its integrity; it affords the means of immediately representing new discoveries and of either tentatively or finally distinguishing phenomena of doubtful significance; and it permits modification of classification, the maintenance of diverse classifications, and the development of classificatory theories at all stages of investigation. Though resting on a partly artificial basis, it is simple and natural in its application.

"The old system is ideographic, connotative and analytic, while the new is alphabetic, denotative and synthetic; the old system trammels the observer by prescribing rules and limits to which his observation must conform, while the new encourages originality by allowing the utmost latitude in expressing the results of observation; the old system tends to retard the development of geologic science, and to restrict its practical application by implicitly postulating its completeness, while the new promotes geology and extends its useful applications by providing the means of expressing discoveries in new as well as in old lines of investigations."

In conclusion I desire to compliment you and congratulate the American Committee on your skill, energy, and success in performing in such an eminently satisfactory manner the arduous duties of Secretary of the Committee.

Yours, very truly,

J. W. POWELL, *Director.*

Note 3.

Copies of the report which appeared in the American Journal of Science were sent to Messrs. Beyrich, Hauchecorne, Stur, Neumayr, Capellini and Vilanova, and some others from whom no reply has been received.

On the other hand Messrs. de Lapparent, Dewalque, Nikitin, Fontannes, Renevier, Choffat, Newberry and Hughes have replied, and in some cases have suggested slight alterations in the text, all of which will be found in the foregoing pages. The undersigned is gratified to be able to ask the reader to compare the text of this pamphlet with that of Report just alluded, to learn how few these changes are.

PERSIFOR FRAZER, *Secretary.*

The Preface, the Circular, and the Report of the Proceedings of the American Committee in New York were approved by every member of that Committee before publication.

THE END.